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NEW YORK AIRPORTS DATA PACKAGE NUMBER 5, JOHN F. KENNEDY INTERN--ETC(U)
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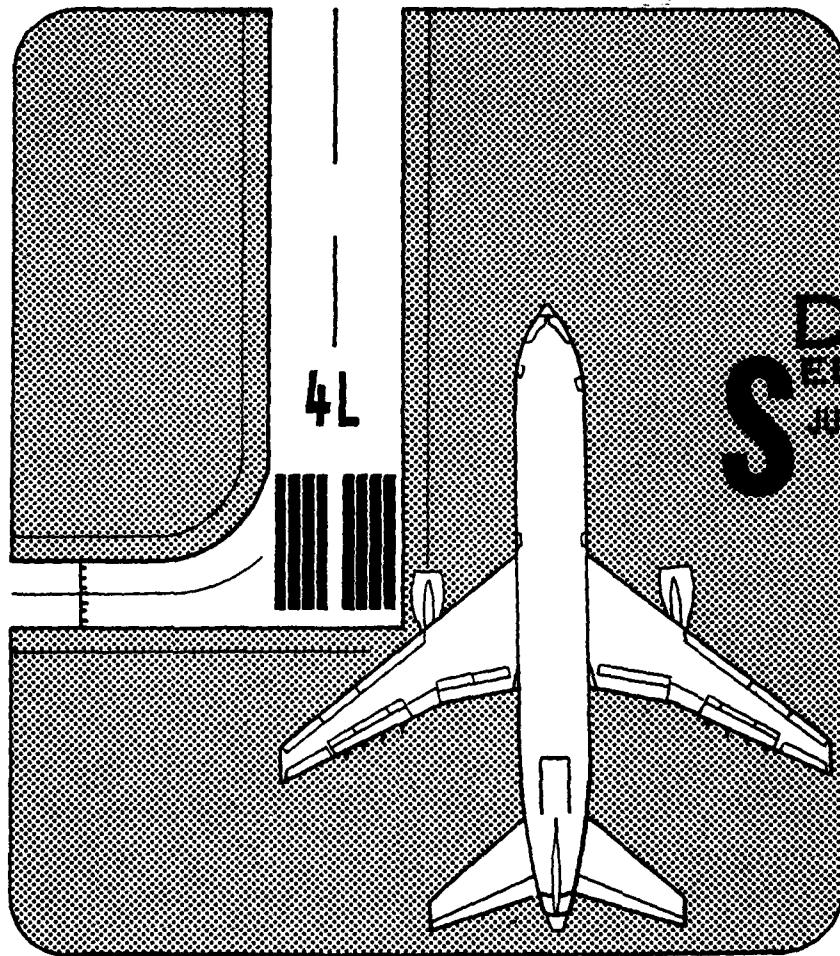
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DATA PACKAGE ^{Number} ~~5~~

JOHN F. KENNEDY INTERNATIONAL AIRPORT,
LA GUARDIA AIRPORT.

AIRPORT IMPROVEMENT
TASK FORCE DELAY STUDIES.

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SAN FRANCISCO INTERNATIONAL AIRPORT
SAN FRANCISCO, CALIFORNIA 94128

Telephone: (415) 347-9521

March 12, 1979

Mr. Michael M. Scott, ATF-4
Federal Aviation Administration
800 Independence Avenue, S.W.
Washington, D.C. 20591

Re: New York Data Package No. 5, March 1979

Dear Mike:

Attached is New York Data Package No. 5. The material in this Data Package is organized to correspond with the agenda for the March 13, 1979 meeting of the New York Task Force:

- Attachment A contains a summary table of available JFK and LGA forecasts
- Attachment B has preliminary tables of Stage 2 Experiments for JFK and LGA and a list of assumptions
- Attachment C presents the updated airfield networks
- Attachment D contains a comparison of Stage 1 peak flow rates with "Phase I" capacity estimates
- Attachment E presents some revisions to Stage 1 results, including graphics

This information should be reviewed by members of the New York Task Force at their March 13, 1979 meeting.

Sincerely,

Steve
Stephen L. M. Hockaday
Manager

SLMH/sq
Enclosure

cc: Mr. J. R. Dupree (ALG-312)
Mr. C. Caiafa (AEA-4)

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Attachment A

NEW YORK FORECASTS
OF TOTAL AIRCRAFT OPERATIONS

John F. Kennedy International Airport

and

LaGuardia Airport

New York

Airport Improvement Task Force Delay Studies

Peat, Marwick, Mitchell & Co.
San Francisco, California

March 1979

Table A-1
NEW YORK FORECASTS
OF TOTAL AIRCRAFT OPERATIONS

LaGuardia Airport

	1982			1987		
	PNYNJ	ATA	FAA	PNYNJ	ATA	FAA
Total Annual	301,700	318,100	382,000	282,300	328,400	386,000
Average Day, Peak Month	883	931	1,120	826	961	1,130
Peak Hour	61	64	77	57	66	78

John F. Kennedy International Airport

	1982			1987		
	PNYNJ	ATA	FAA	PNYNJ	ATA	FAA
Total Annual	326,450		388,000	330,680		436,000
Average Day, Peak Month	1,003		1,190	1,016		1,340
Peak Hour	90		107	91		121

Attachment B

STRAWMAN LISTS OF
STAGE-2 EXPERIMENTS AND ASSUMPTIONS

John F. Kennedy International Airport

and

LaGuardia Airport

New York

Airport Improvement Task Force Delay Studies

Peat, Marwick, Mitchell & Co.
San Francisco, California

March 1979

Table B-1

STAGE 2 EXPERIMENTAL DESIGN
 JOHN F. KENNEDY INTERNATIONAL AIRPORT
 NEW YORK TASK FORCE DELAY STUDIES
 (prioritized list)

Cumulative Sequence No. ^a	Stage-2 Experiment No.	Priority Rank	Corresponding Stage-1 No.	Model	Runways Used		Weather
					Arrivals	Departures	
14	26	1	2	ASM	22L	22R	IFRL
15	27	2	18	ASM	4L, 4R	4L	IFRL
16	28	3	6	ASM	31R	31L	IFRL
17	29	4	8	ASM	13L	13R	IFRL
18	30	5	1	ASM	13R, 22L,	22R	IFRL
					22R		
19	31	6	7	ASM	13L, 13R	13R	VFR1
20	32	7	16	ASM	31L, 31R	31L, 31R	VFR1
21	33	8	4	ASM	4R	4L	IFRL
22	34	9	15	ASM	31L, 31R	31L, 31R	IFRL
					22L	22R	
23	35	1	2	ASM	4L, 4R	4L	IFRL
24	36	2	18	ASM	31R	31L	IFRL
25	37	3	6	ASM	13L	13R	IFRL
26	38	4	8	ASM	13R, 22L,	22R	VFR1
27	39	5	1	ASM	13L, 13R	13R	IFRL
					22R		
28	40	6	7	ASM	31L, 31R	31R	VFR1
29	41	7	16	ASM	4R	4L	IFRL
30	42	8	4	ASM	31L, 31R	31L, 31R	IFRL
31	43	9	15	ASM	To be Determined		IFRL
32	44	?	?	ASM	To be Determined		PNYNJ-1982
33	45	?	?	ASM	To be Determined		PNYNJ-1987
34	9	NA	NA	ADM	NA	NA	today//today/
35	10	NA	NA	ADM	NA	NA	none 1982/1982/
36	11	NA	NA	ADM	NA	NA	1982 1982/1982/
37	12	NA	NA	ADM	NA	NA	none 1982/1982/
38	13	NA	NA	ADM	NA	NA	1982/today/
39	22	NA	NA	ADM	NA	NA	none 1987/1987/
40	23	NA	NA	ADM	NA	NA	1987 1987/1987/
41	24	NA	NA	ADM	NA	NA	none 1987/today/
42	25	NA	NA	ADM	NA	NA	1987/today/ none

a. There were 13 simulation experiments (ASM) in Stage 1, JFK.

Table B-2

STAGE 2 EXPERIMENTAL DESIGN
LaGuardia Airport
NEW YORK TASK FORCE DELAY STUDIES
(prioritized list)

Cumulative Sequence No. ^a	Experiment No.	Stage-2 Experiment No.	Priority Rank	Corresponding Stage-1 No.	Model	Runways Used		Weather	Demand/ATC/Improvements	
						Arrivals	Departures			
15	31	1	1	ASM	22	13	13	VFR1	1982	
16	32	2	2	ASM	22	13	13	IFR1	1982	
17	33	3	9	ASM	13	4	4	VFR1	1978	
18	34	4	9	ASM	13	4	4	VFR1	1982	
19	35	5	9	ASM	13	4	4	IFR1	1982	
20	36	6	11	ASM	22	13	13	IFR2	1982 6 ASDE	
21	37	1	1	ASM	22	13	13	VFR1	1987	
22	38	2	2	ASM	22	13	13	IFR1	1987	
23	39	4	9	ASM	13	4	4	VFR1	1987	
24	40	5	9	ASM	13	4	4	IFR1	1987	
25	41	6	11	ASM	22	13	13	IFR2	1987	
26	42	7	new	ASM	31	4	4	VFR1	1978	
27	43	8	new	ASM	31	4	4	VFR1	1982	
28	44	9	new	ASM	31	4	4	VFR1	1987	
29	45	10	new	ASM	31	31	31	VFR1	1978	
30	46	11	new	ASM	31	31	31	VFR1	1982	
31	47	12	new	ASM	31	31	31	VFR1	1987	
33	48	?	sensitivity	ASM	To be Determined		PNWNY-1982		PNWNY-1987	
34	49	?	sensitivity	ASM	To be Determined		PNWNY-1987		1978	
35	50	1	West Taxiway	ASM	22	13	13	IFR1	1978	
36	51	1	West Taxiway	ASM	22	13	13	IFR1	1978	
37	52	1	West Taxiway	ASM	4	4	4	IFR1	1978	
38	53	1	West Taxiway	ASM	4	4	4	IFR1	1978	
39	14	NA	NA	ADM	NA	NA	NA	NA	today/today/none	
40	15	NA	NA	ADM	NA	NA	NA	NA	1982/1982/	
41	16	NA	NA	ADM	NA	NA	NA	NA	1982	
42	17	NA	NA	ADM	NA	NA	NA	NA	1982/1982/none	
43	18	NA	NA	ADM	NA	NA	NA	NA	1982/1982/none	
44	27	NA	NA	ADM	NA	NA	NA	NA	1987/1987/	
45	28	NA	NA	ADM	NA	NA	NA	NA	1987/1987/none	
46	29	NA	NA	ADM	NA	NA	NA	NA	1987/today/	
47	30	NA	NA	ADM	NA	NA	NA	NA	1987/today/none	

a. There were 14 simulation experiments (ASM) in Stage 1, LGA.

New York
Airport Improvement Task Force Delay Studies

STAGE-2 EXPERIMENTS
GENERAL OVERALL ASSUMPTIONS

1. Aircraft separations (arrival-arrival, departure-departure, etc.) from Report No. FAA-EM-78-8A will be used (near-term for 1982 and far-term for 1987) in all Stage-2 Experiments except the LGA West Taxiway Experiments. Airspace constraints will not be considered.
2. The 1978 hourly distribution of traffic, percent arrivals, and heavy aircraft will be applied, proportionately, to distribute the future LGA and JFK forecasts, which will be in terms of average-day, peak-month operations.
3. PNYNJ Forecasts of general aviation, scheduled commuter, and overseas airline operations (JFK) will be used in all Stage-2 simulation experiments.
4. PNYNJ forecasts will be used in four (4) sensitivity experiments (one for each airport and each time period). These experiments are not specified as to their particular runway configuration, weather, etc.
5. All of the airfield network improvements provided to PMM&Co. are assumed in place by 1982 except for the LGA West Taxiway improvements where Stage I is assumed in place by 1982 and Stage II by 1987. These two stages are described in the minutes of the December 14, 1978 Task Force Meeting.
6. Based on the Stage-1 delay simulation results, JFK Experiments 2, 6, and 8 yield very similar delay results as follows:

JFK Experiment No.	Average Delay During Peak-Demand Hour, 1900-2000 Hours	
	Arrivals	Departures
2	112.1	7.4
6	111.5	7.6
8	112.2	6.3

As Stage-2 is now defined, these experiments will yield very similar delay results.

Attachment C

UPDATED AIRFIELD NETWORKS

John F. Kennedy International Airport

and

LaGuardia Airport

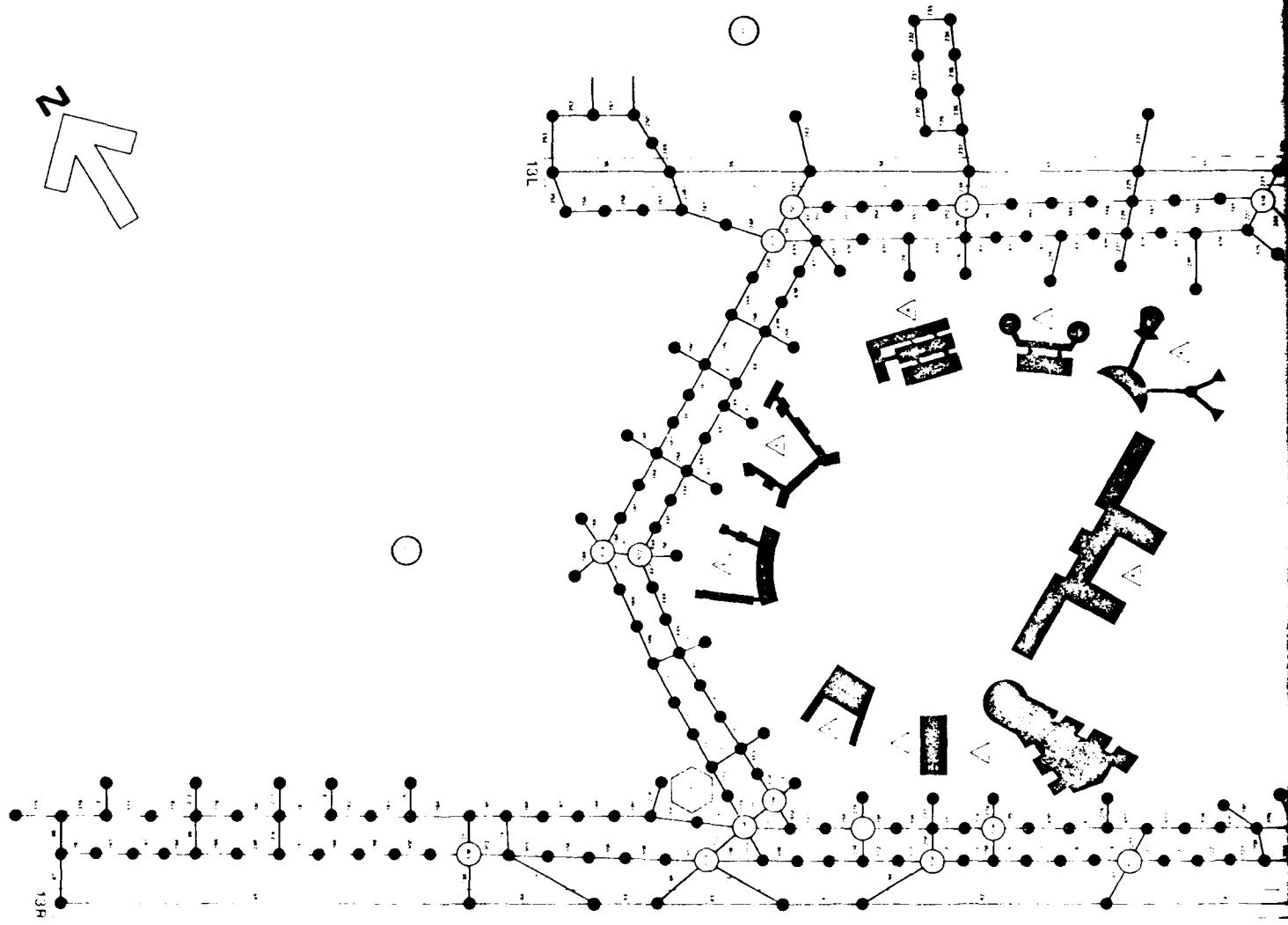
New York

Airport Improvement Task Force Delay Studies

Peat, Marwick, Mitchell & Co.
San Francisco, California

March 1979

2



JOHN F. KENNEDY INTERNATIONAL AIRPORT

AIRFIELD NETWORK

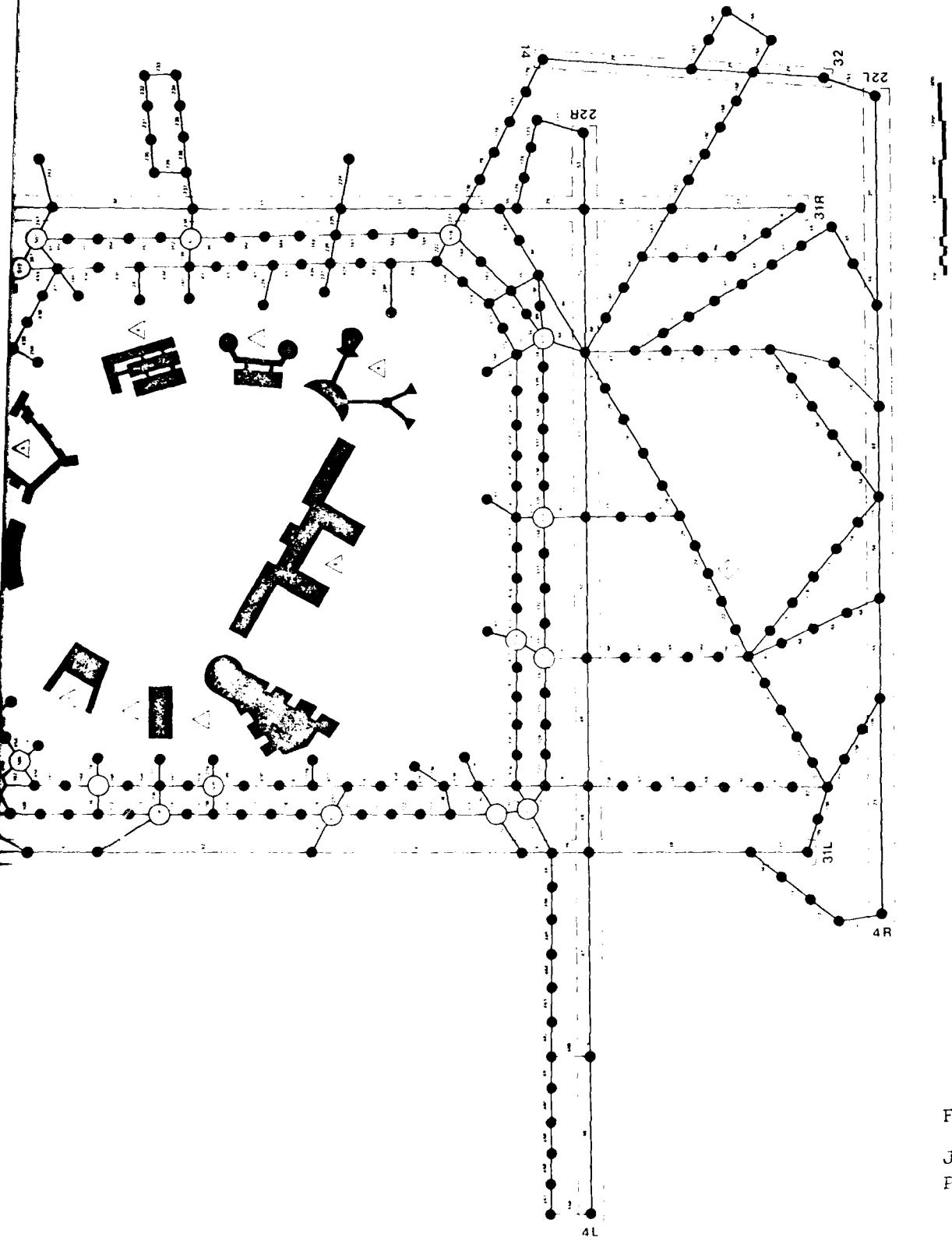
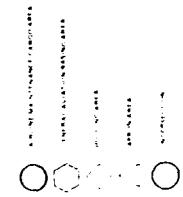
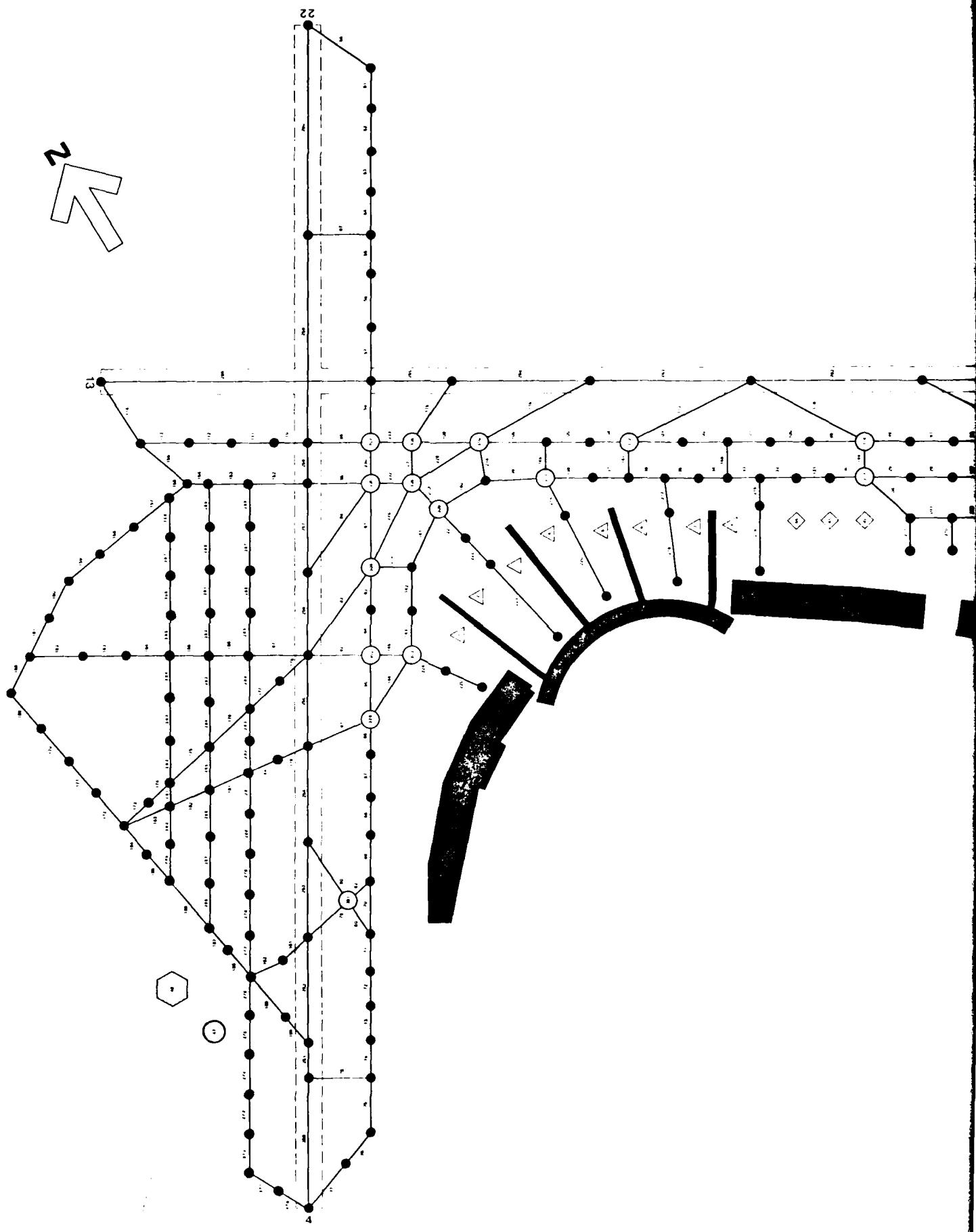


Figure C-1

JFK AIRFIELD NETWORK
PMM&Co. March 1979



LA GUARDIA AIRPORT

AIRFIELD NETWORK

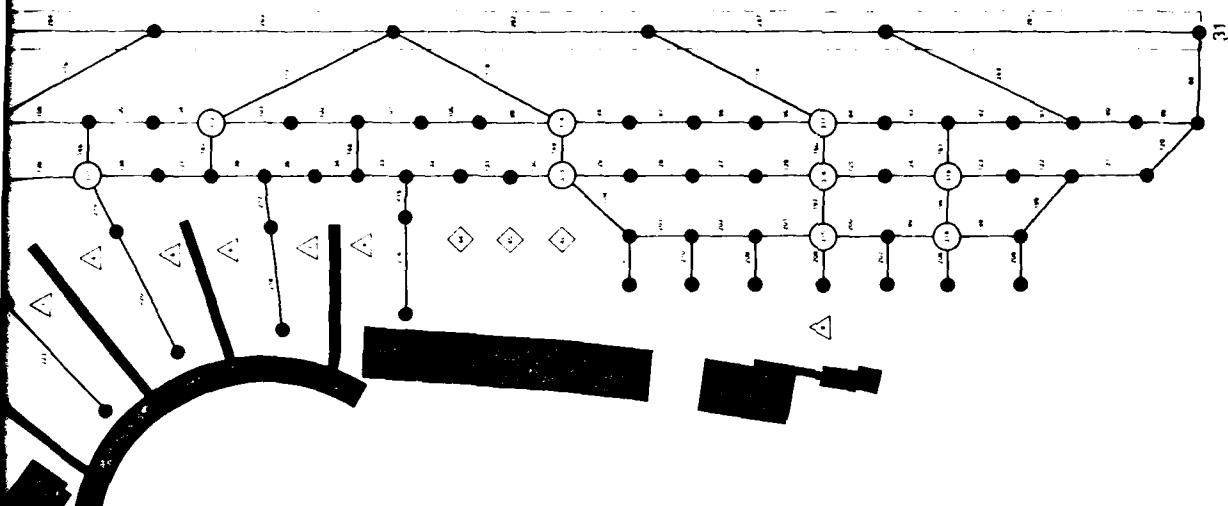
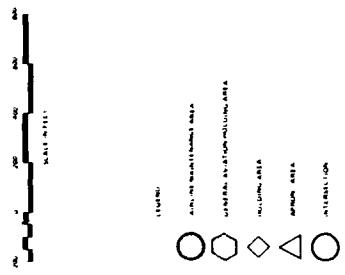


Figure C-2

LGA AIRFIELD NETWORK
PMM&Co. March 1979

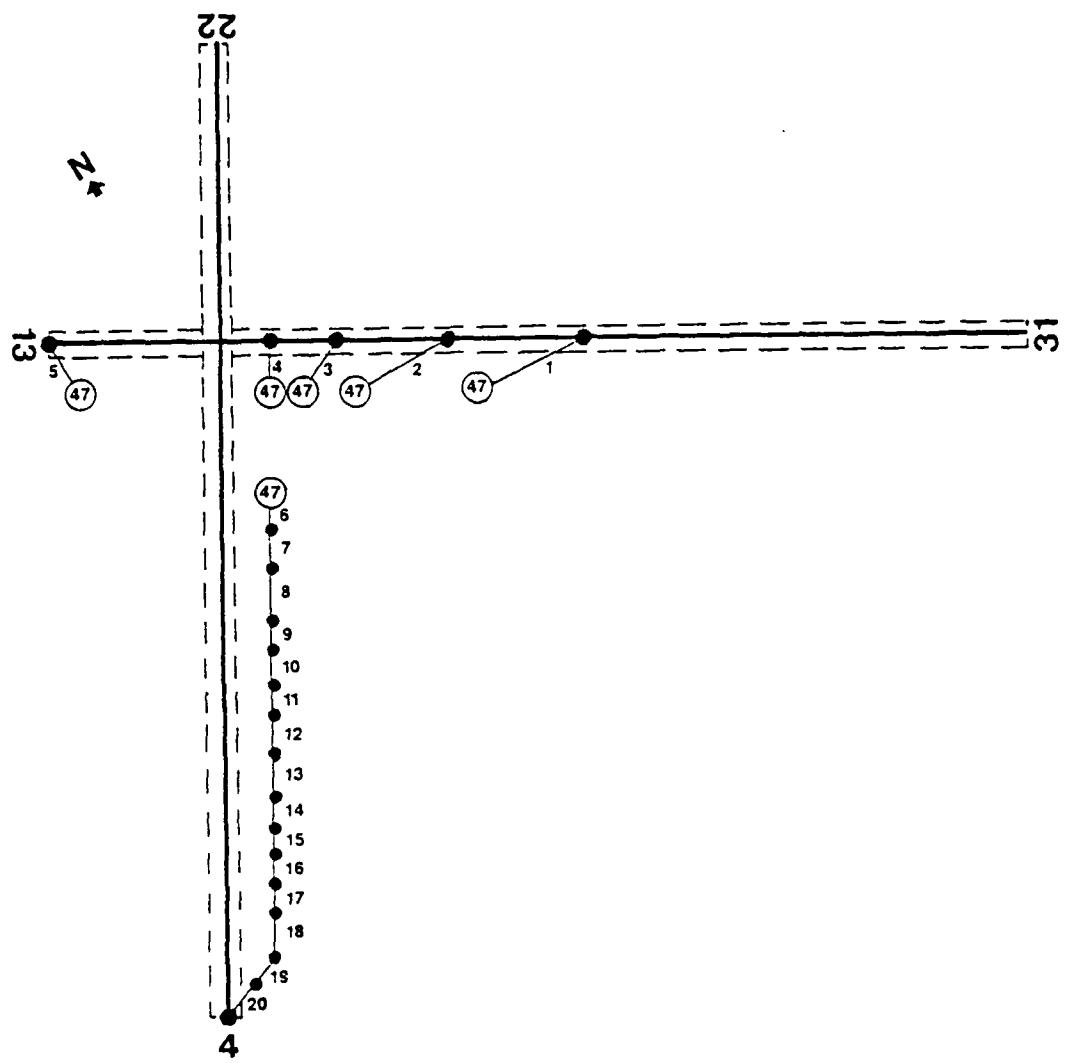


Figure C-3

LGA SHORT FORM AIRFIELD NETWORK
PMM&Co. March 1979

Attachment D

COMPARISON OF FLOW RATES
AND CAPACITIES

John F. Kennedy International Airport
and
LaGuardia Airport

New York
Airport Improvement Task Force Delay Studies

Peat, Marwick, Mitchell & Co.
San Francisco, California

March 1979

Table D-1
 Airport Improvement Task Force Delay Studies
 New York Task Force
 COMPARISON OF FLOW RATES AND CAPACITIES^a

Airport	Experiment No.	Arrival Runways	Departure Runways	Case No.	Weather	Peak-Demand Hour, Flow Rate ^b		Percent Arrivals	Corresponding Capacity Study Estimate ^c
						Hour	Flow Rate		
JFK	3	4L, 4R	4L	4	VFR	64	73	67%	75
JFK	18	4L, 4R	4L	5	VFR	59	62	58%	60
LGA	2	22	13	2	IFR	63	63	48%	74 (1) ^d
LGA	3	22	13	3	IFR2	48	49	39%	54 (1) ^d
LGA	6	13	13	22	VFR	61	61	49%	50 (2)
LGA	7	13	13	23	IFR1	45	47	38%	46
LGA	10A	13	13	23b	IFR1	29	32	25%	34

a. Questions from December 21, 1978 meeting of Task Force.

b. Reported in Data Package No. 4.

c. From Phase 1 Capacity Study.

d. See attached explanations of differences.

Table D-1
Explanations of Flow Rate versus
Capacity Comparisons

(1) The minimum IFR arrival-arrival separations used in the Stage-1 simulations, as described in Report No. FAA-EM-78-8A, differ slightly from the ones used in the Phase I Capacity Study; as follows (numbers are in units of nautical miles):

FAA-EM-78-8A				Phase I Capacity Study						
Trail Aircraft Class				Trail Aircraft Class						
	A	B	C	D		A	B	C	D	
Lead Aircraft Class	A	3.0	3.0	3.0	3.0	A	2.1	2.3	2.3	2.5
	B	4.0	3.0	3.0	3.0	Lead Aircraft Class	3.6	2.3	2.3	2.4
	C	4.0	3.0	3.0	3.0	Air-craft Class	3.6	2.3	2.3	2.4
	D	6.0	5.0	5.0	4.0	Craft Class	5.6	4.6	4.6	3.6

(2) The flow rates of this experiment are higher than the Phase I capacity estimates primarily because of the departure queue-trigger, interarrival gap feature of the model which provides extra separations between arrivals to allow departures to be released when the departure queue exceeds a specified length. The following comparison shows the importance of this feature:

Experiment No.	Queue Trigger	Interarrival Gap (min.)	Peak Flow Rates		
			Arrivals	Departures	Total
6	None	None	38	13	51
6	10	1.85	31	30	61

In the second case, where the queue trigger operates, arrival gaps are "tailored" to permit departures. In the Phase I capacity study, tailoring of arrival gaps was not used.

The departure queue trigger-interarrival gap values chosen for this experiment (10 aircraft and 1.85 minutes, respectively) represent a very efficient "tailoring" scheme.

To further investigate this question, a new capacity run was performed in which arrival-arrival separations were tailored exactly to allow the release of one departure. The total runway capacity was found to be approximately 65 aircraft per hour.

In addition, 1977 PMS data were examined to determine the flow rates that were achieved in hours where (1) VFR conditions applied, (2) arrivals and departures were on Runway 13, and (3) there was high demand in preceding hours putting pressure on the operation. The results follow:

<u>Date</u>	<u>Hour</u>	<u>Modified Demand</u>	<u>Flow Rate</u>		
		<u>in Hour and Previous Hours</u>	<u>Arr.</u>	<u>Dep.</u>	<u>Total</u>
10/30/77	13-1400	56, 55	24	36	60
10/19/77	11-1200	72, 65, 59	32	27	59
10/19/77	12-1300	72, 65	33	33	66
10/19/77	19-2000	63, 71	30	26	56
4/19/77	11-1200	75, 59, 47, 60	36	28	64
4/4/77	17-1800	68, 61	31	29	60
4/4/77	18-1900	65	32	28	60

The total achieved flow rate values is the last column of the foregoing table range from 56 to 66 aircraft per hour. Therefore, it appears that optimal tailoring of arrival gaps occurs in some hours.

Attachment E

STAGE-1 EXPERIMENTS
REVISED RESULTS AND GRAPHICS

John F. Kennedy International Airport
and
LaGuardia Airport

New York
Airport Improvement Task Force Delay Studies

Peat, Marwick, Mitchell & Co.
San Francisco, California

March 1979

Table E-1
 NEW YORK TASK FORCE DELAY STUDIES
 John F. Kennedy International Airport
 Summary Results of Stage-1 Experiments (Revised)
 Airfield Simulation Model Runs

Experiment No.	Runways Used		Time Frame	Weather Conditions	Highest Hourly Flow Rates			Average Runway Delays in Peak Demand Hour -Min.	Taxi-In Peak	Taxi-Out Peak	Major Comparison Cases
	Arrivals	Departures			Arrivals ^b	Departures ^b	Arrivals				
1	13R, 22R _c	22R	1977	VFR	50	43	50	29	79	0.7	11.6
2	22L	22R	1977	IFR	29	38	26	18	64	60+	7.4
2A	22L	22R	1977	IFR	29	38	26	36	64	60+	7.4
19	22L	22R	1977	IFR	29	38	26	38	64	60+	7.4
3	4L, 4R	4L	1977	VFR	49	36	49	24	73	1.0 ^c	33.8 ^c
4	4R	4L	1977	IFR	25	38	24	34	62	60+	8.2
18	4L, 4R	4L	1977	IFR	36	28	36	26	62	50, 3	32.1 ^d
5	31L, 31R	31L	1977	VFR	47	39	47	31	78	1.5	17.8
16	31L, 31R	31L, 31R	1977	VFR	49	44	49	21	60	2, 1	3.6
6	31R	11L	1977	IFR	29	39	27	39	66	60+	7.6
15	31L, 31R	31L, 31R	1977	IFR	50	45	50	32	82	3, 0	5.9
7	13L, 13R	13R	1977	VFR	47	39	47	32	79	1, 6	16.0
8	13L	13R	1977	IFR	29	39	26	39	65	60+	6, 3

a. For the peak-demand hour, 1900-2000 hours, five hours into the simulation.

b. Highest arrival flow rate is usually not in same hour as the highest departure flow rate.

c. These results represent a case where the "departure queue trigger-interarrival gap" does not space out arrivals to allow departures to get out, intentionally left in to show effect.

d. In Experiment 18 the only departure stream interacts with arrivals. This is the only case where this occurs in IFR, which is why departure runway delays are so high.

Table E-2
 NEW YORK TASK FORCE DELAY STUDIES
 LaGuardia Airport
 Summary Results of Stage-1 Experiments (Revised)
 Airfield Simulation Model Runs

Experiment No.	Runways Used		Time Frame	Weather Conditions	Highest Hourly Flow Rates			Average Runway Delays in Peak- Demand Hour a - Min.			Average Taxiing Delays (minutes)			Major Comparison Cases		
	Arrivals	Departures			Arrivals ^b	Departures ^b	Arrivals		Departures	Arrivals		Taxi-in Peak ^a				
							Arrivals	Departures	Total	Arrivals	Departures	Total	Arrivals	Departures		
1	22	13	1977	VFK1	19	20	34	20	54	12.5	45.9	6.4	3.1	Baseline		
19	22	13	1977	VFK1	39	40	36	40	76	3.0	0.8	0.0	0.3	1		
2	22	13	1977	IFK1	30	34	30	33	63	30.9	0.9	0.0	0.2	Baseline		
3	22	13	1977	IFK2	28	30	19	30	49	36.2	28.6	0.0	0.1	Baseline		
11	22	13	1977	IFK2	30	28	30	29	58	19.9	8.3	0.0	0.2	3		
20	22	13	1977	IFK2	39	39	34	39	73	2.5	0.8	0.0	0.3	3		
4	4	4	1977	IFK2	27	19	26	19	45	28.5	49.2	4.2	5.1	Baseline		
5	4	4	1977	VFK1	39	42	39	42	81	12.8	1.5	0.0	0.3	Baseline		
6	13	13	1977	VFP1	31	31	31	30	61	23.9	25.0	0.0	0.2	Baseline		
7	13	13	1977	IFP1	24	29	18	29	47	54.4	13.0	0.0	0.2	Baseline		
10	13	13	1977	IFP1	30	30	30	29	59	30.9	10.3	0.0	0.3	7		
10A	13	13	1977	IFP1	9	24	6	24	32	60+	0.6	0.0	0.1	7, 10		
8	4	4	1977	IFP1	36	34	29	34	63	30.9	5.0	0.0	0.2	Baseline		
9	13	4	1977	IFP1	27	29	27	29	56	36.4	4.8	0.1	0.1	7		

a. For the peak-demand hour, 1700-1800 hours; three hours into the simulation.

b. Highest arrival flow rate is usually not in same hour as highest departure flow rate.

LGA STAGE - 1 EXPERIMENTSExperiment No. 1Objective:

To provide baseline delay estimates, in VFRL conditions, for the following runway-use configuration:

<u>Arrival Runway</u>	<u>Departure Runways</u>
22	13

Related Comparison Experiments:

Experiment 19 has same runway-use configuration and weather conditions but a different aircraft mix, to reflect impact of quota system alternatives.

Length and Level of Detail of Simulation Run:

From 1500 to 2100 with 15-minute summaries.

Results:

Below is a table that shows selected results for the peak-demand hour, 1700-1800 hours, and average values over the 6-hour simulation period.

Operation Type	Performance Measure	Units	This Experiment	
			Average ^a	Peak ^b
Arrival	Flow Rate	a/c per hr.	35.5	38
Arrival	Air Delay	min.	12.8	12.5
Arrival	Taxi-In Delay	min.		6.4
Departure	Flow Rate	a/c per hr.	14.8	13
Departure	Runway Delay	min.	73.0	45.9
Departure	Taxi-Out Delay	min.		3.1

a. Average over the entire simulation period.

b. For the peak-demand hour, 1700-1800 hours, 3 hours into the simulation.

LGA STAGE - 1 EXPERIMENTS

Experiment No. 6
(p. 26, Data Package No. 4)

Objective:

To obtain baseline delay estimates, in VFR1 conditions, for the following runway-use configurations:

<u>Arrival Runways</u>	<u>Departure Runways</u>
13	13

Related Comparison Experiments:

Experiments 7, 10, and 10A have the same runway-use, but they have different weather, namely IFR1, and improvements.

Length and Level of Detail of Simulation Run:

From 1500 to 2100 with 1-hour summaries.

Results:

Below is a table that shows selected results for the peak-demand hour, 1700-1800 hours, and average values over the 6-hour simulation period.

<u>Operation Type</u>	<u>Performance Measure</u>	<u>Units</u>	<u>This Experiment</u>	
			<u>Average^a</u>	<u>Peak^b</u>
Arrival	Flow Rate	a/c per hr.	29.8	31
Arrival	Air Delay	min.	32.8	23.9
Arrival	Taxi-In Delay	min.	6.3	0.0
Departure	Flow Rate	a/c per hr.	27.5	30
Departure	Runway Delay	min.	29.0	25.0
Departure	Taxi-Out Delay	min.	1.4	0.2

a. Average over the entire simulation period.

b. For the peak-demand hour, 1700-1800 hours, 3 hours into the simulation.

LGA - STAGE 1

Experiment No. 10
(p. 28, Data Package No. 4)

Objective:

To evaluate impact of relocating R13 glide slope antenna to reduce critical zone impact when there are mixed operations on R13.

Related Comparison Experiments

Experiment No. 7 serves as the comparison case for this experiment.

Length and Level of Detail of Simulation Run:

From 1500 to 2100 with 15-minute summaries.

Anticipated Results:

Reduced delays and increased capacities, due to reduction of glide slope critical-zone impact on mixed operations, compared with Experiment 7.

Summary Comparison:

Operation Type	Performance Measure	Units	This Experiment	Experiment No. 7
			Average ^a	Peak ^b
Arrival	Flow Rate	a/c per hr.	28.5	30
Arrival	Air Delay	min.	41.7	30.9
Arrival	Taxi-In Delay	min.		0.0
Departure	Flow Rate	a/c per hr.	27.8	29
Departure	Runway Delay	min.	16.6	10.3
Departure	Taxi-Out Delay	min.		0.3

a. Average over the entire simulation period.

b. For the peak-demand hour, 1700-1800 hours, 3 hours into the simulation.

LGA - STAGE 1

Experiment No. 10A
(p. 29, Data Package No. 4)

Objective:

To evaluate the impact of LGA-TEB interaction on delays experienced by mixed operations on R13 in IFR1 weather conditions.

Related Comparison Experiments:

Experiment No. 7 serves as the "No-other-improvement" comparison case for this experiment. Experiment No. 10 is the comparison case if one wants to examine the limits imposed on the delay reductions of Experiment 10 by the LGA-TEB interaction.

Length and Level of Detail of Simulation Run:

From 1500 to 2100 with 15-minute summaries.

Anticipated Results:

Much greater delays due to interaction with TEB.

Summary Comparison:

Operation Type	Performance Measure	Units	This Experiment		Experiment No. 7	
			Average ^a	Peak ^b	Average ^a	Peak ^b
Arrival	Flow Rate	a/c per hr.	8.0	8.0	19.8	18
Arrival	Air Delay	min.	110.6	109.0	78.1	54.4
Arrival	Taxi-In Delay	min.		0.0		0.0
Departure	Flow Rate	a/c per hr.	18.2	21	24.1	27
Departure	Runway Delay	min.	0.6	0.6	13.1	13.0
Departure	Taxi-Out Delay	min.		0.1		0.2

a. Average over the entire simulation period.

b. For the peak-demand hour, 1700-1800 hours, 3 hours into the simulation.

LGA - STAGE 1

Experiment No. 8
(p. 30, Data Package No. 4)

Objective:

To obtain baseline delay estimates, in IFR1 conditions, for the following runway use configuration:

<u>Arrivals</u>	<u>Departures</u>
4	4

Related Comparison Experiments:

Experiment No. 13 has same runway use and weather conditions as No. 8 but with an improved taxiway network for departures west of R4/22.

Length and Level of Detail of Simulation Run:

From 1500 to 2100 with 15-minute summaries.

Results:

Below is a table that shows selected results for the peak-demand hour, 1700-1800 hours, and average values over the 6-hour simulation period.

Operation Type	Performance Measure	Units	This Experiment	
			Average ^a	Peak ^b
Arrival	Flow Rate	a/c per hr.	28.3	29
Arrival	Air Delay	min.	42.7	30.9
Arrival	Taxi-In Delay	min.		0.0
Departure	Flow Rate	a/c per hr.	29.2	30
Departure	Runway Delay	min.	5.8	5.0
Departure	Taxi-Out Delay	min.		0.2

a. Average over the entire simulation period.

b. For the peak-demand hour, 1700-1800 hours, 3 hours into the simulation.

LGA - STAGE 1

Experiment No. 9
 (p. 31, Data Package No. 4)

Objective:

To evaluate the potential delay savings of improving airspace procedures so that the flow of arrivals to R13, in IFR weather conditions, is independent of the flow of departures on R4. A new, high-speed exit from R13 is also assumed.

Related Comparison Experiments:

The potential benefits of these improved airspace procedures are obtained by comparison with Experiment No. 7, arrivals and departures on R13.

Length and Level of Detail of Simulation Run:

From 1500 to 2100 with 15-minute summaries.

Anticipated Results:

Lower delays and greater capacities than in Experiment 7.

Summary Comparison:

Operation Type	Performance Measure	Units	This Experiment		Experiment No. 7	
			Average ^a	Peak ^b	Average ^a	Peak ^b
Arrival	Flow Rate	a/c per hr.	25.8	27	19.8	18
Arrival	Air Delay	min.	33.8	36.4	78.1	54.4
Arrival	Taxi-In Delay	min.		0.1		0.0
Departure	Flow Rate	a/c per hr.	26.8	26	24.1	27
Departure	Runway Delay	min.	9.8	4.8	13.1	13.0
Departure	Taxi-Out Delay	min.		0.1		0.2

a. Average over the entire simulation period.

b. For the peak-demand hour, 1700-1800 hours, 3 hours into the simulation.

FIGURE 1A AVERAGE RUNWAY FLOW RATES

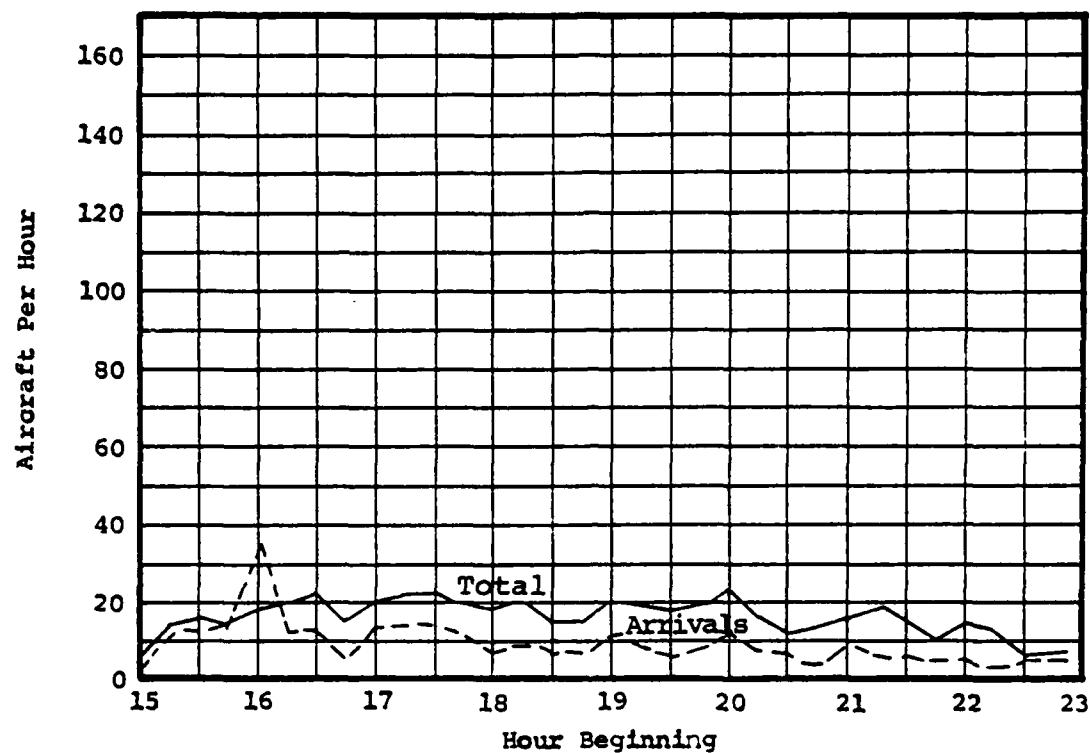


FIGURE 1B AVERAGE RUNWAY DELAYS

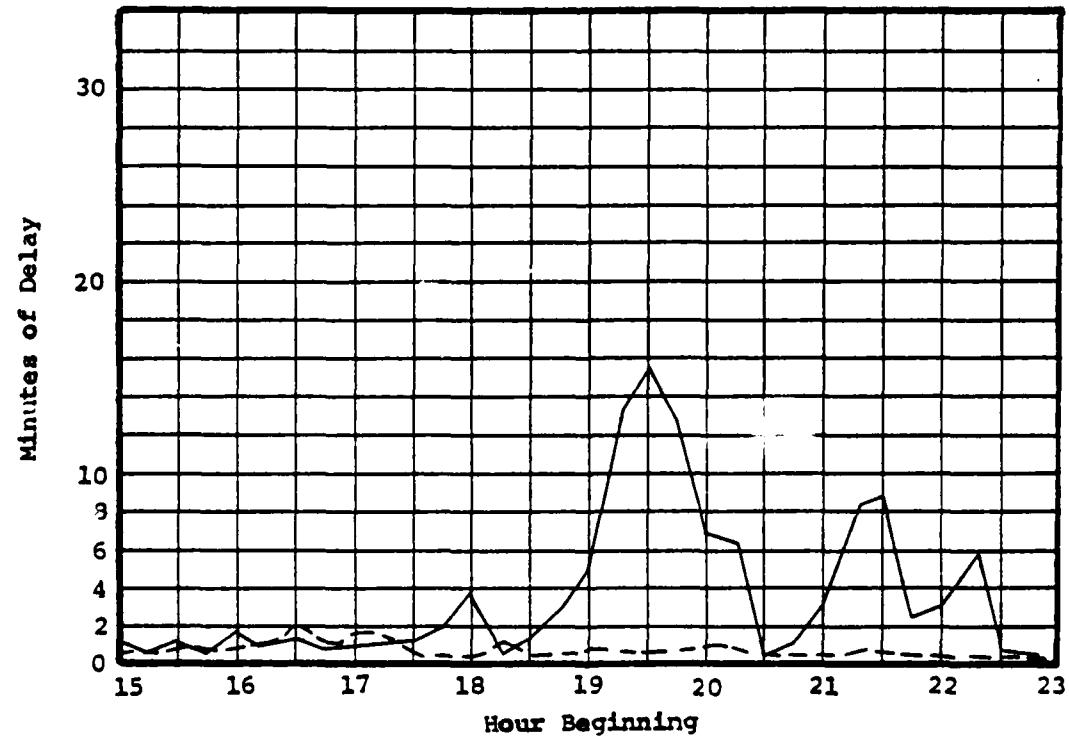


FIGURE 1C AVERAGE TAXIWAY DELAYS

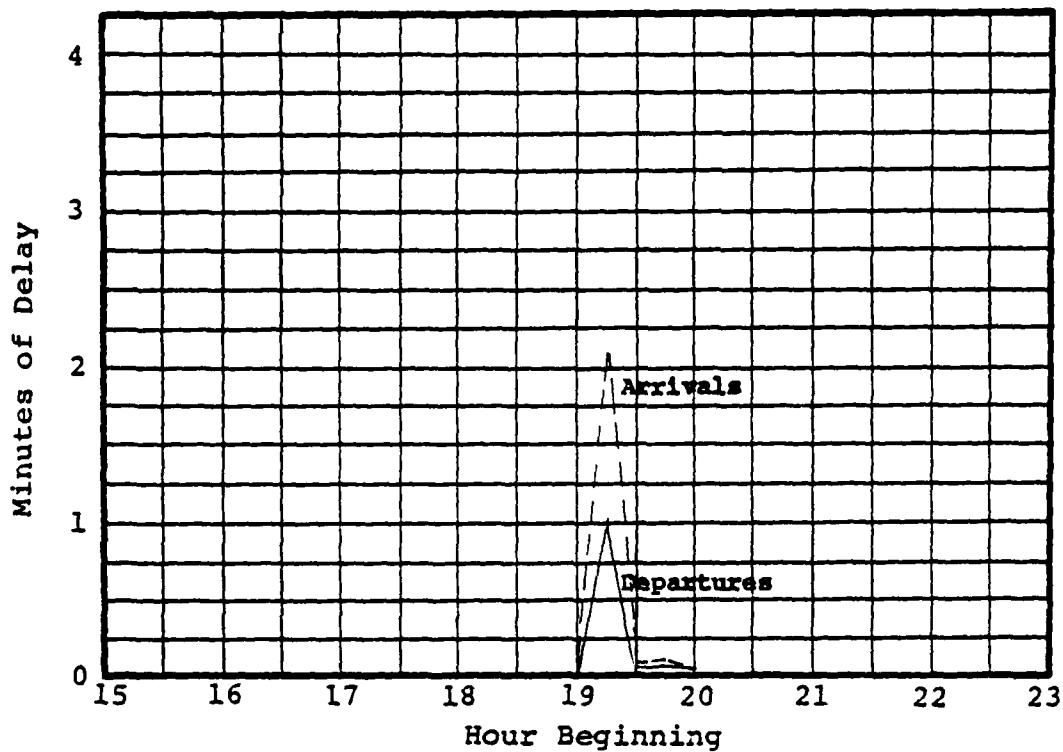


FIGURE 1D AVERAGE TAXIWAY TRAVEL TIMES

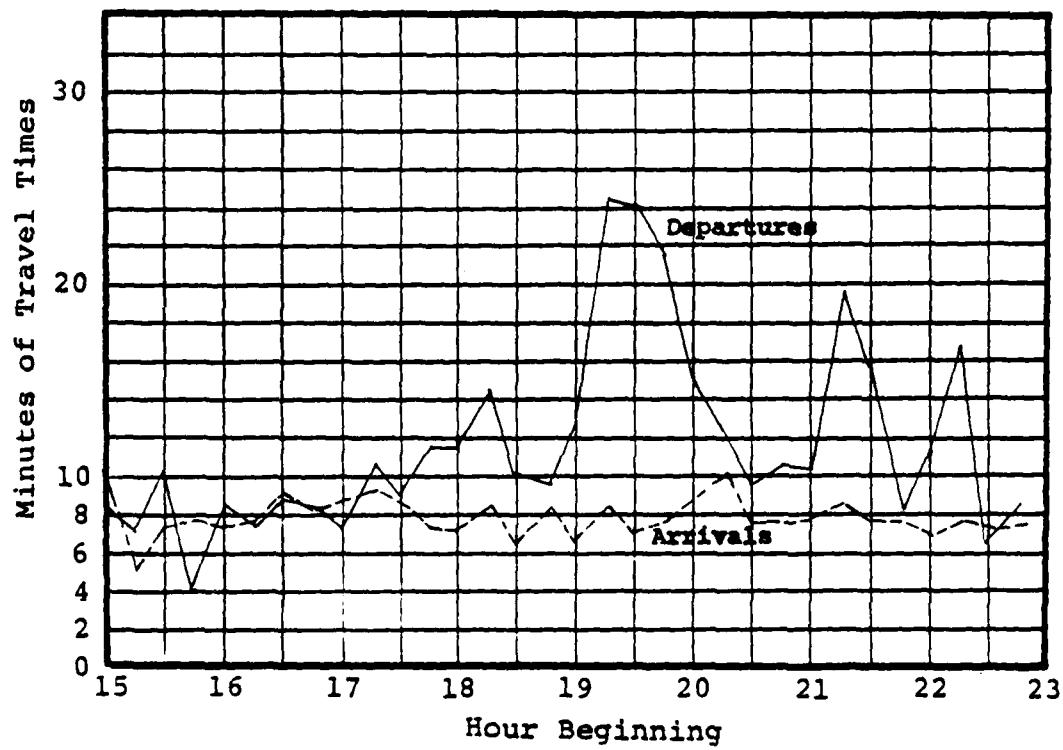


FIGURE 2A AVERAGE RUNWAY FLOW RATES

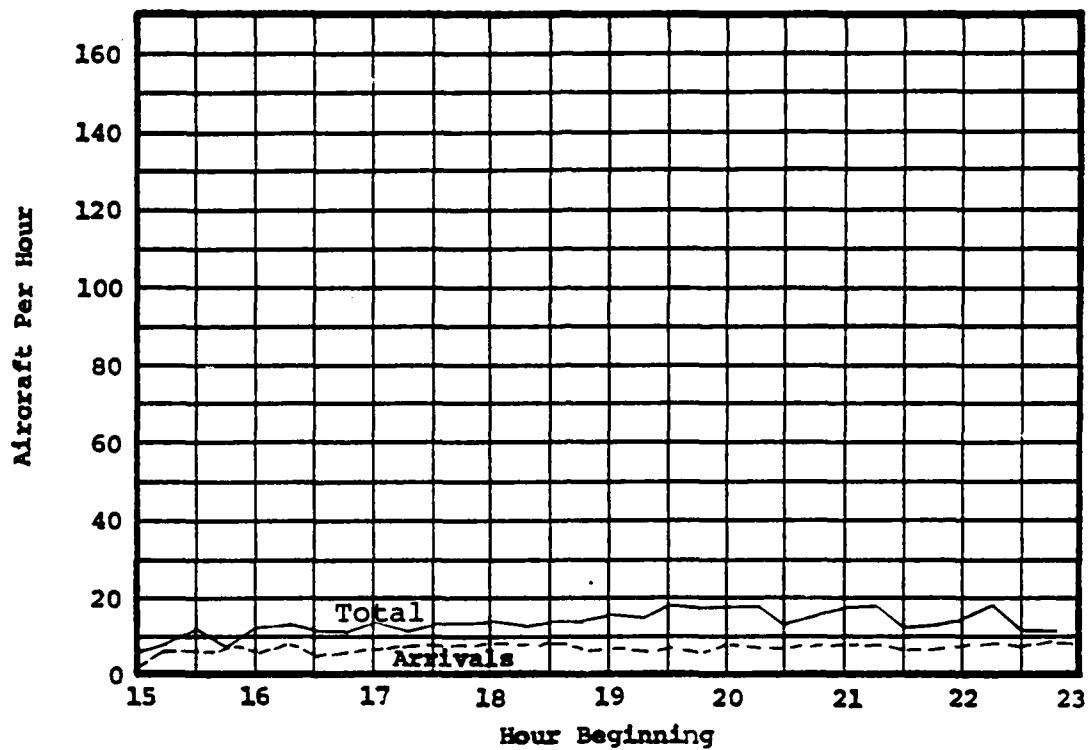


FIGURE 2B AVERAGE RUNWAY DELAYS

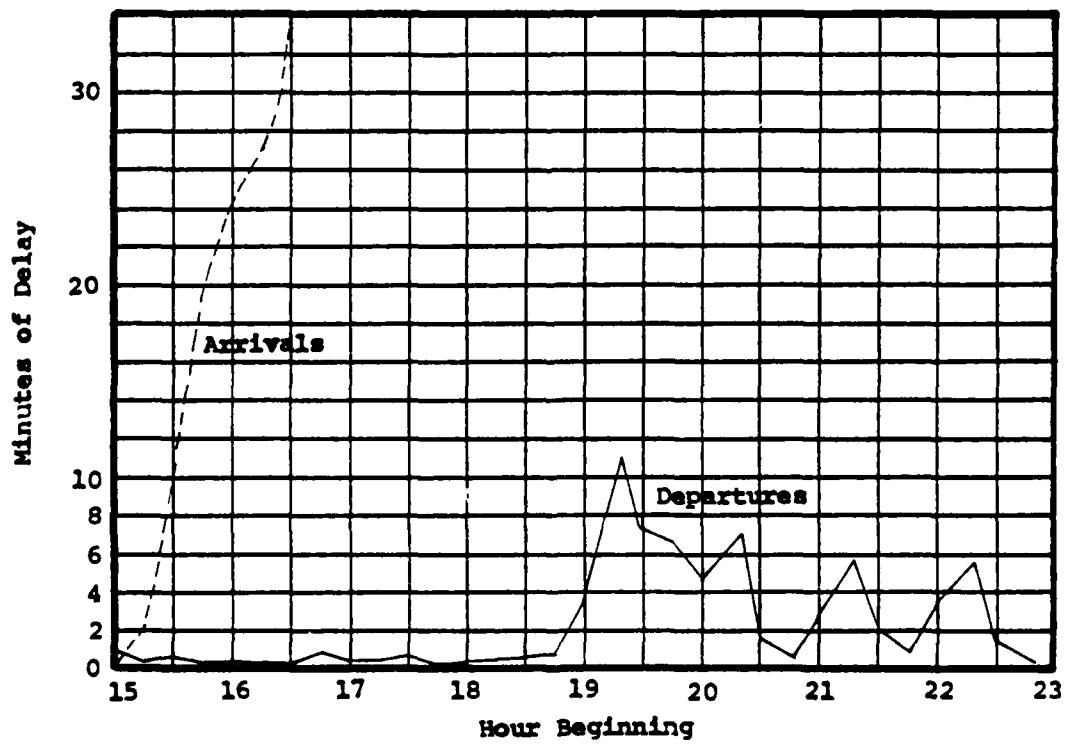


FIGURE 2C AVERAGE TAXIWAY DELAYS

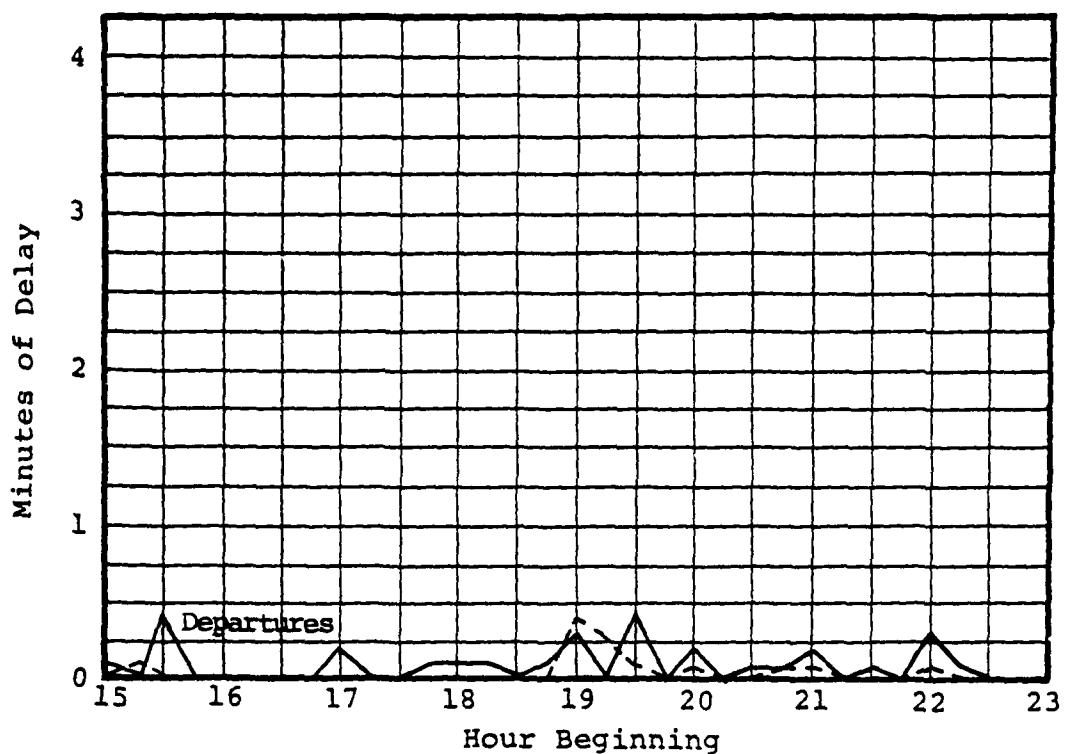


FIGURE 2D AVERAGE TAXIWAY TRAVEL TIMES

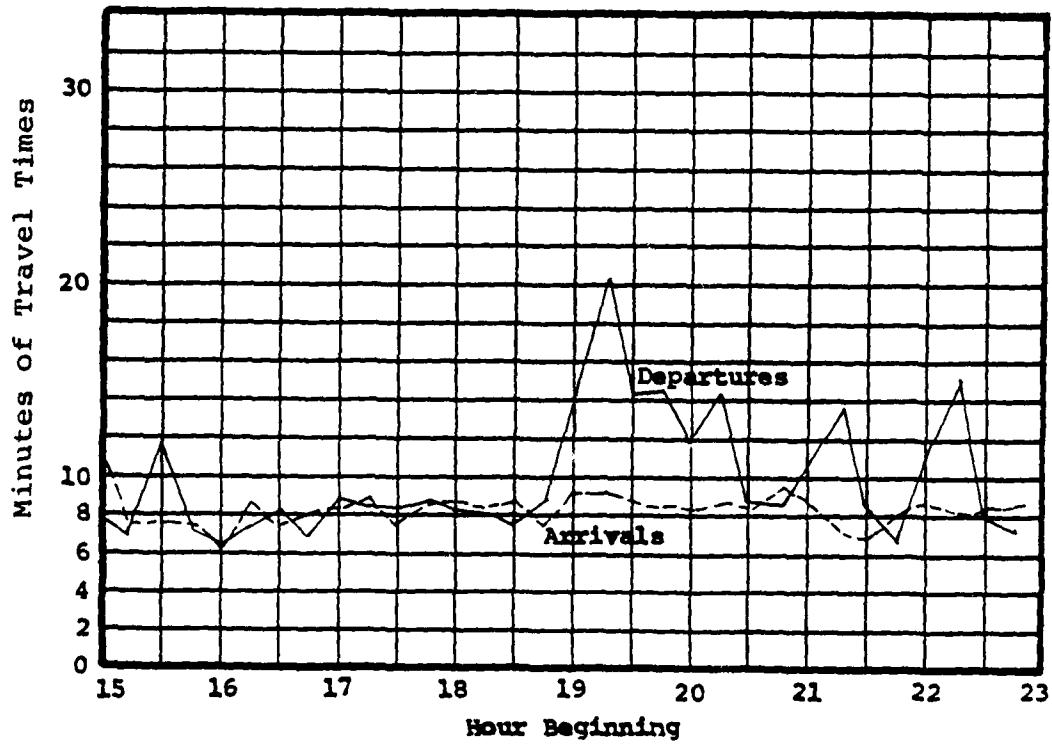


FIGURE (2A) A AVERAGE RUNWAY FLOW RATES

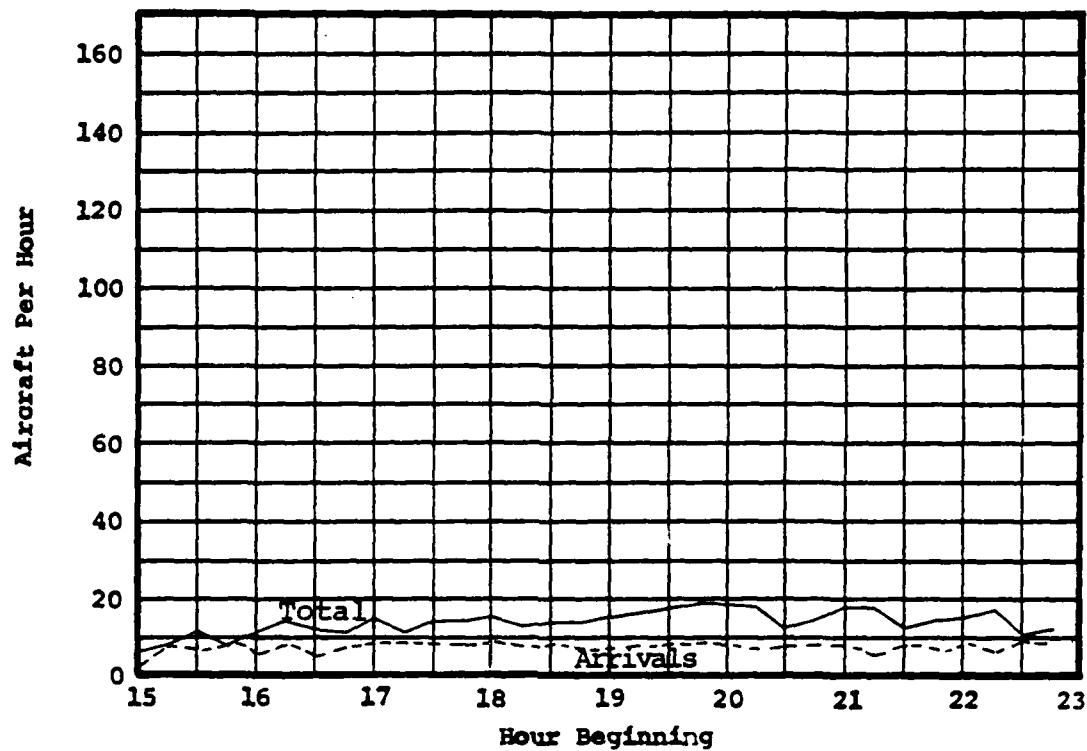


FIGURE (2A) B AVERAGE RUNWAY DELAYS

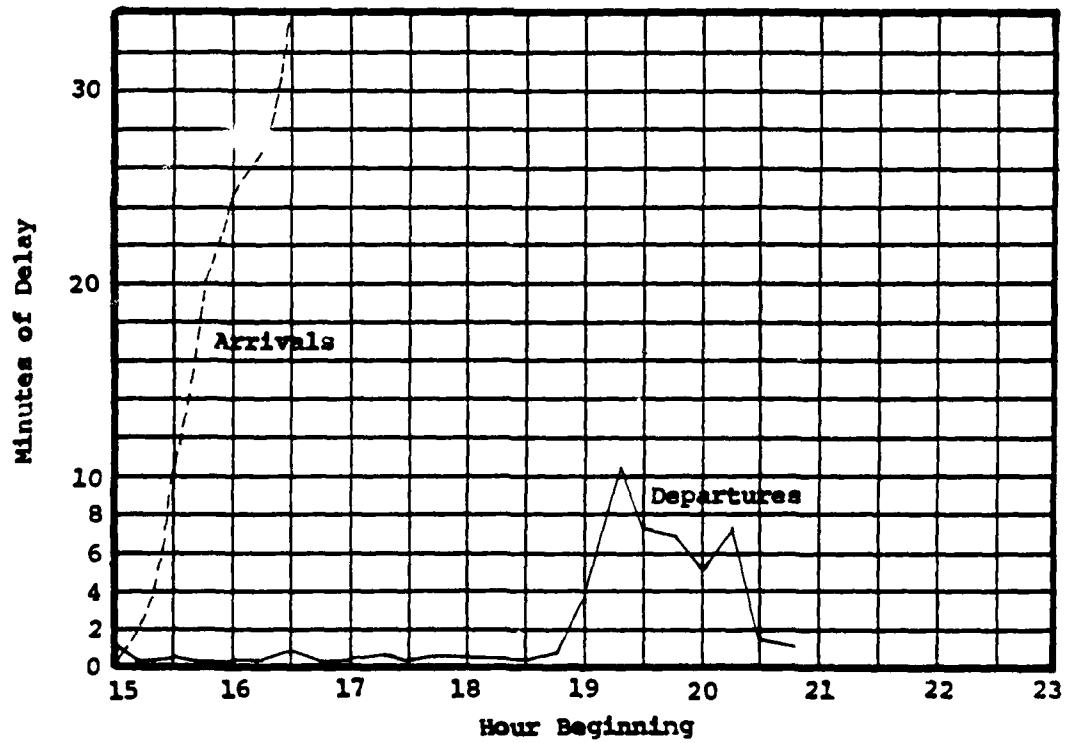
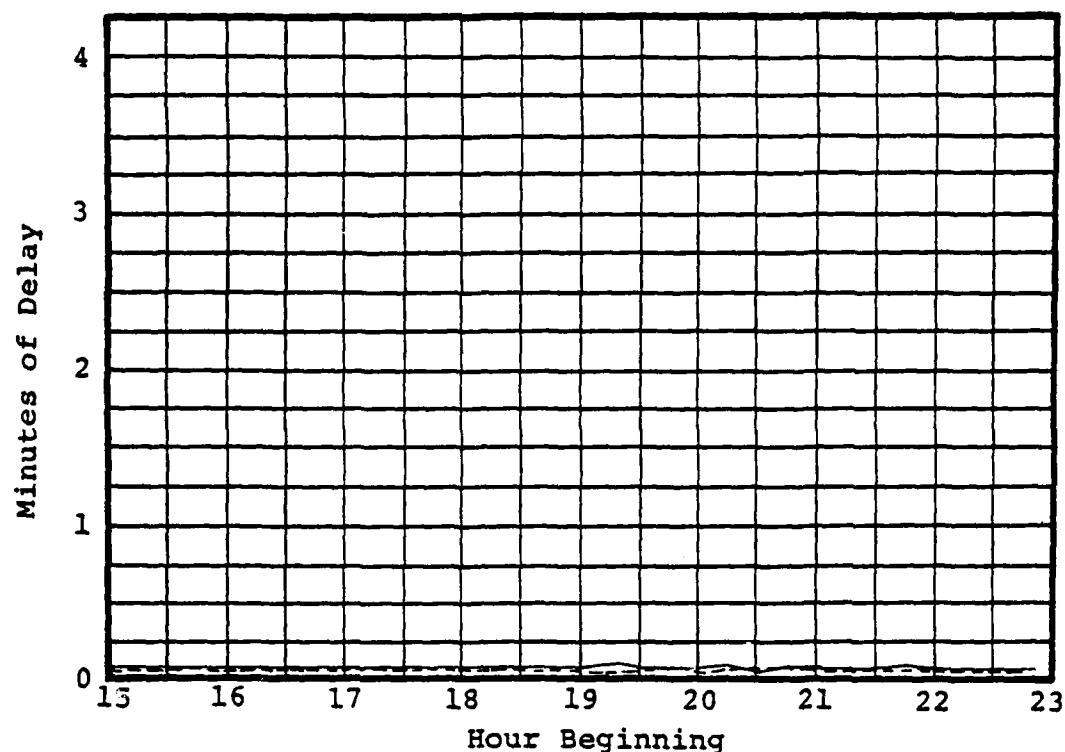


FIGURE (2A)C AVERAGE TAXIWAY DELAYS



FIGURE(2A)D AVERAGE TAXIWAY TRAVEL TIMES

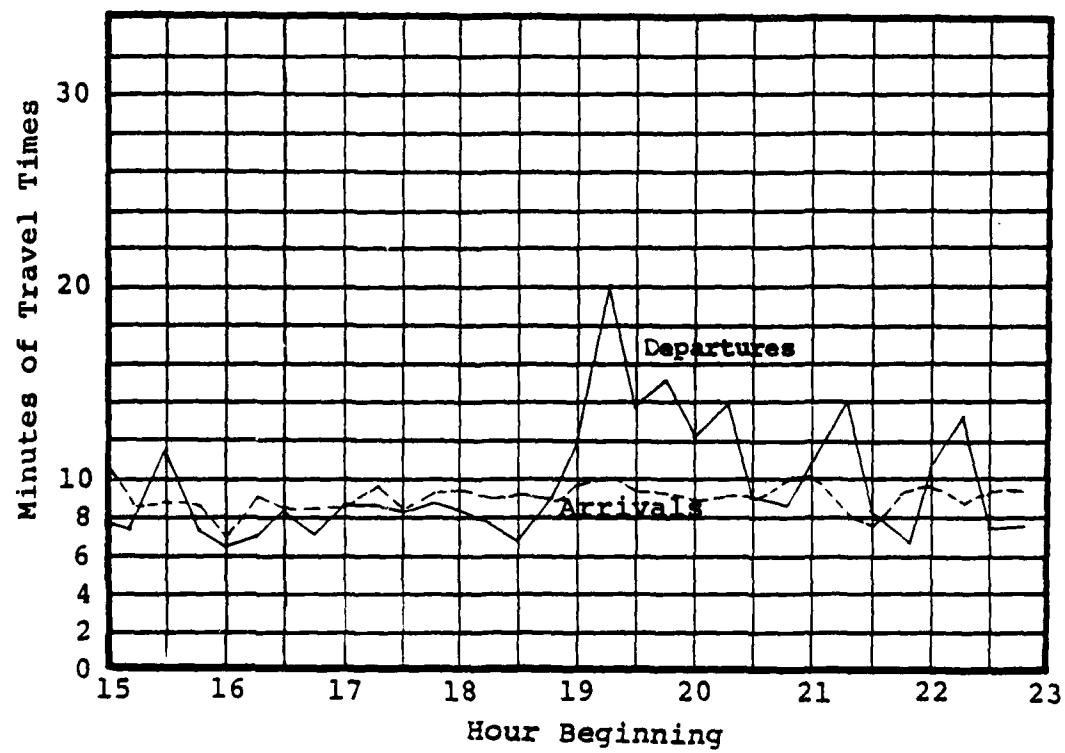


FIGURE 3A AVERAGE RUNWAY FLOW RATES

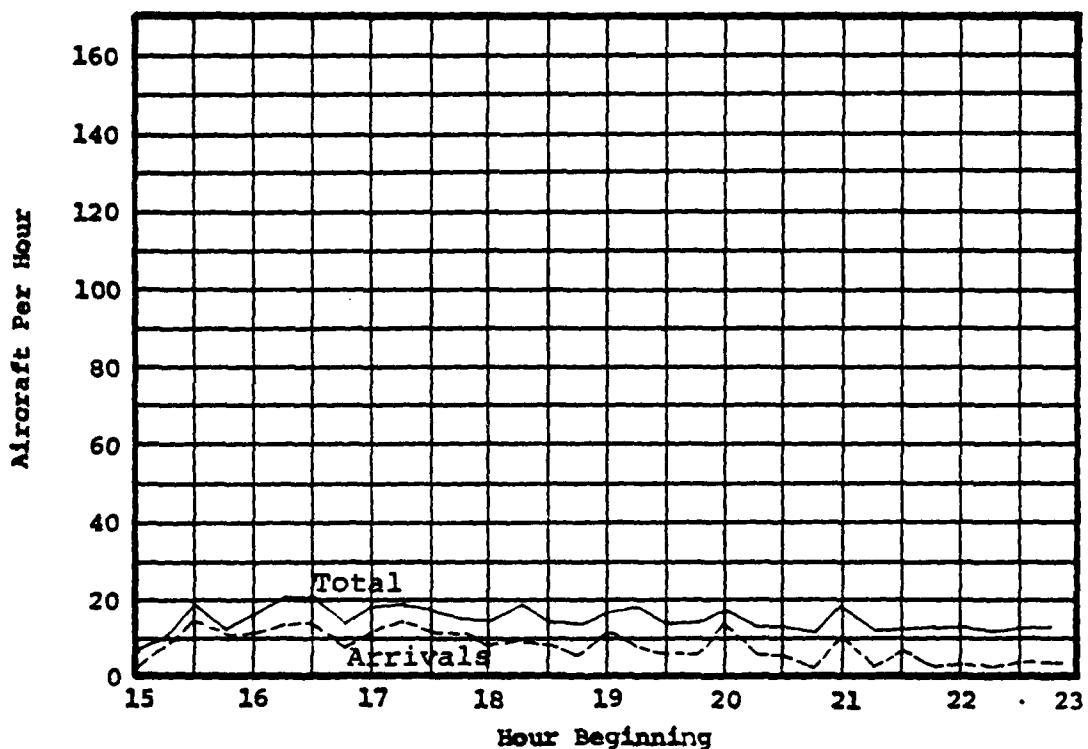


FIGURE 3B AVERAGE RUNWAY DELAYS

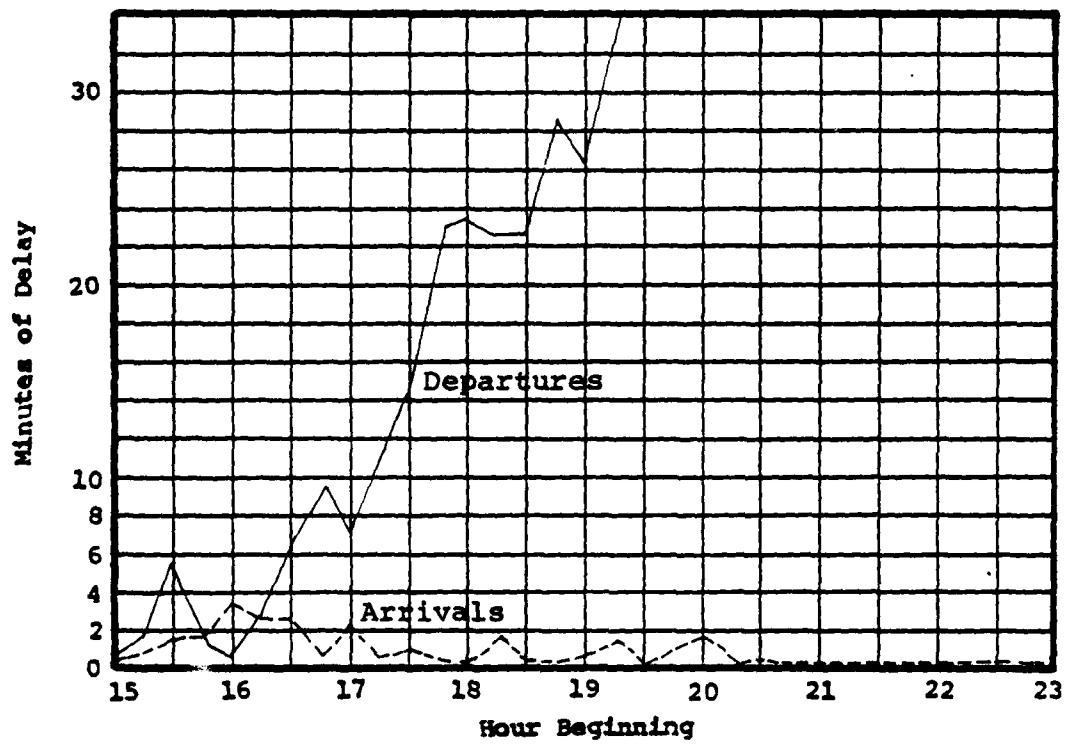


FIGURE 3C AVERAGE TAXIWAY DELAYS

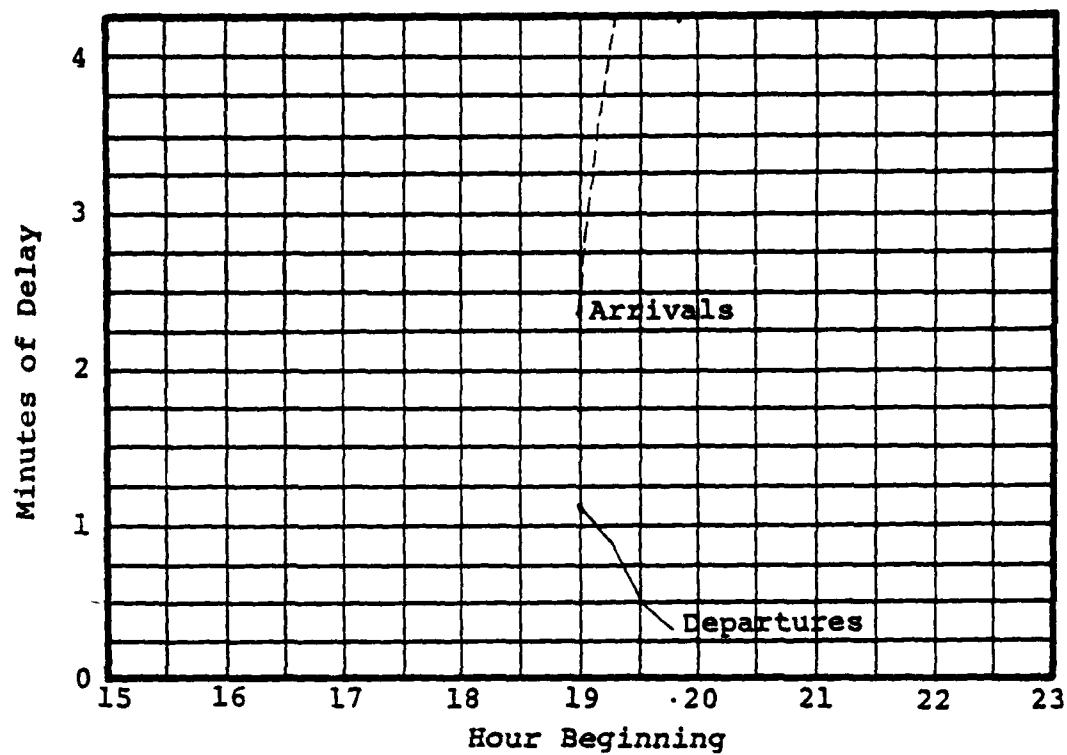


FIGURE 3D AVERAGE TAXIWAY TRAVEL TIMES

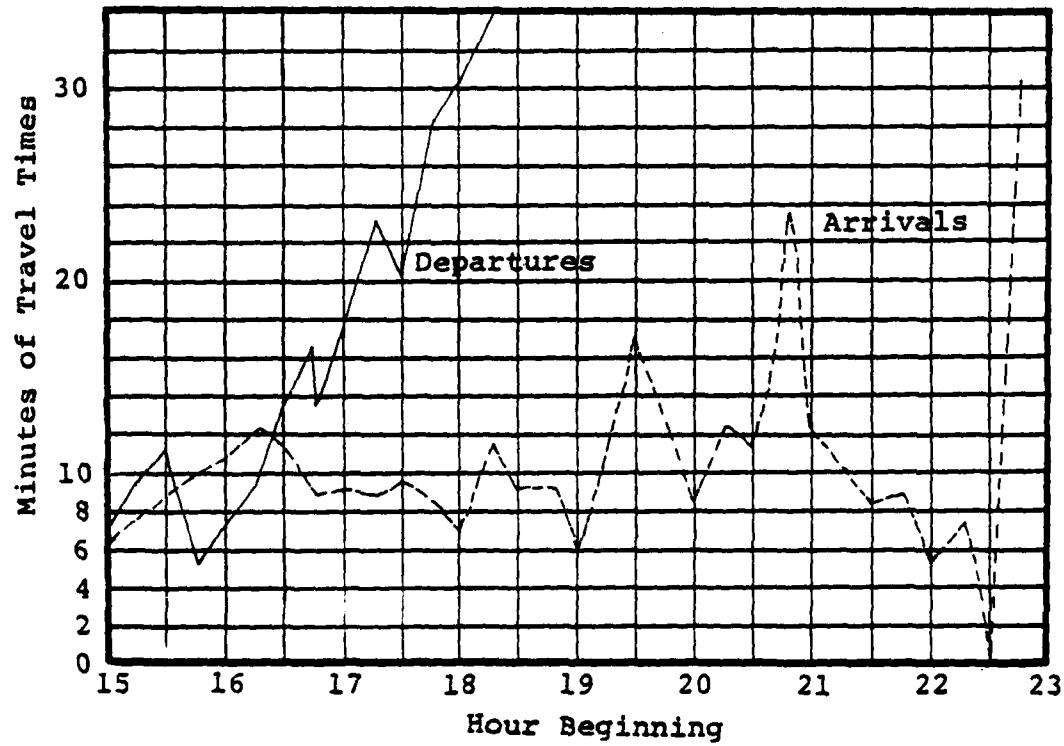


FIGURE 4A AVERAGE RUNWAY FLOW RATES

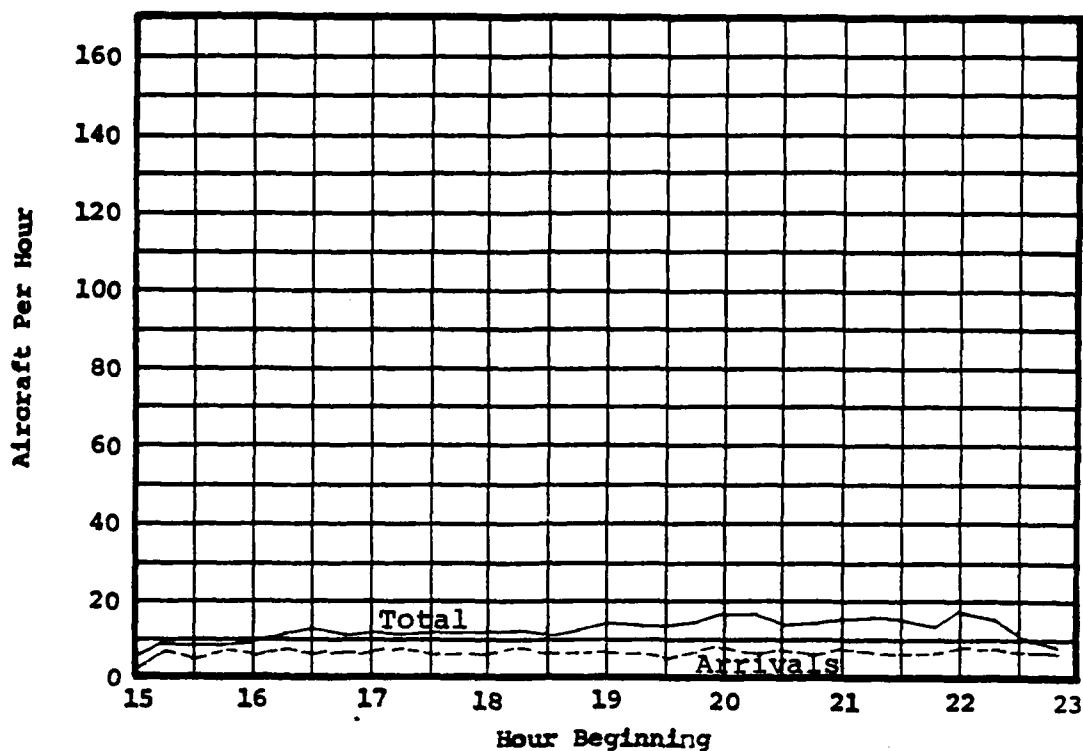


FIGURE 4B AVERAGE RUNWAY DELAYS

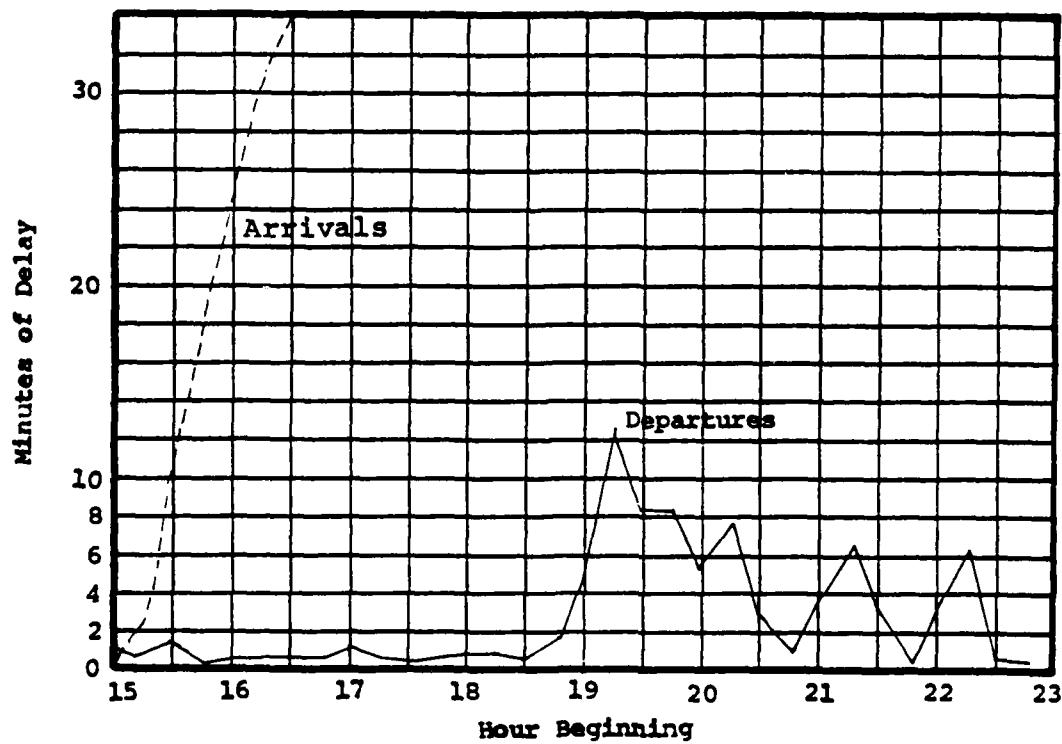


FIGURE 4C AVERAGE TAXIWAY DELAYS

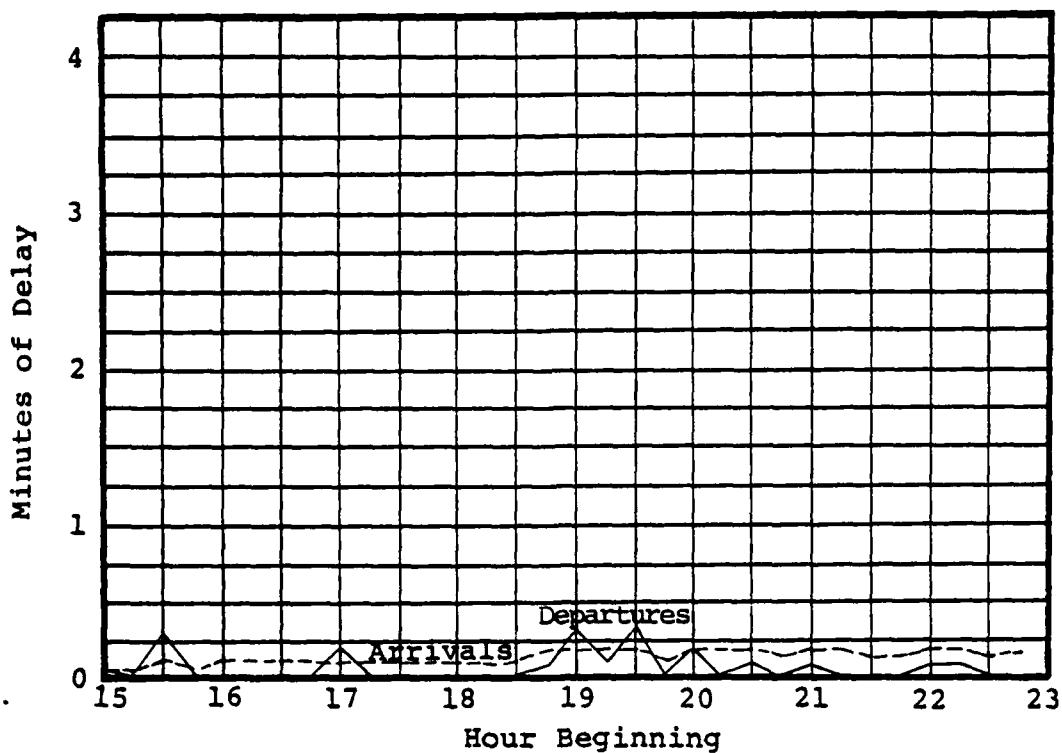


FIGURE 4D AVERAGE TAXIWAY TRAVEL TIMES

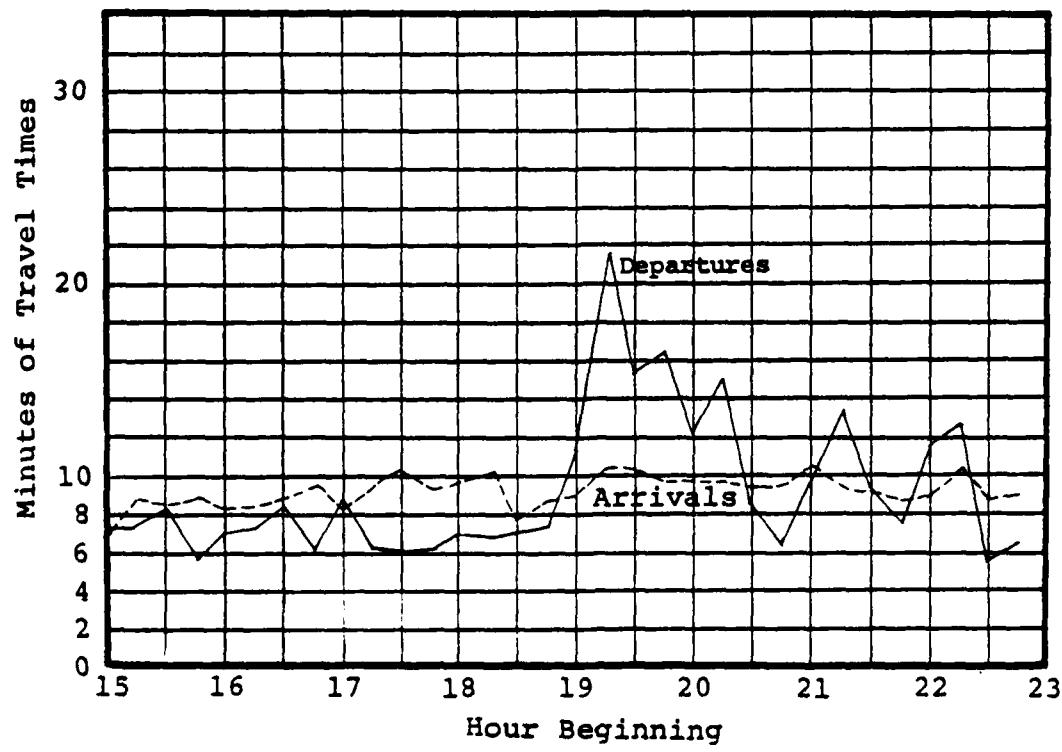


FIGURE 5A AVERAGE RUNWAY FLOW RATES

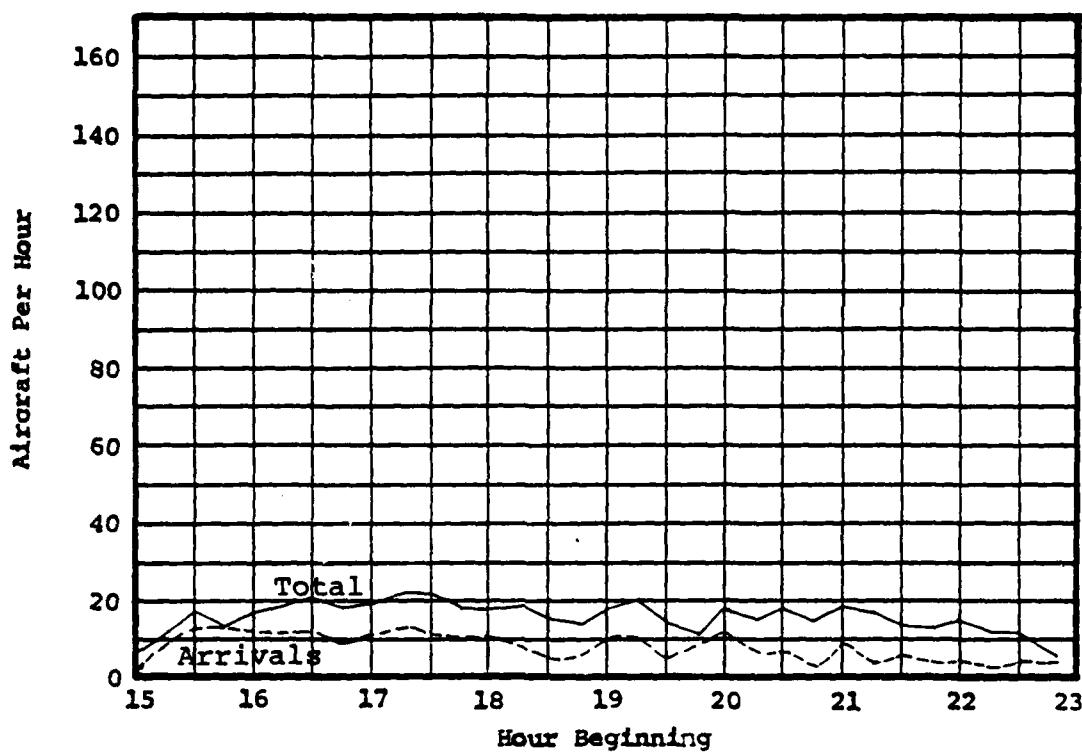


FIGURE 5B AVERAGE RUNWAY DELAYS

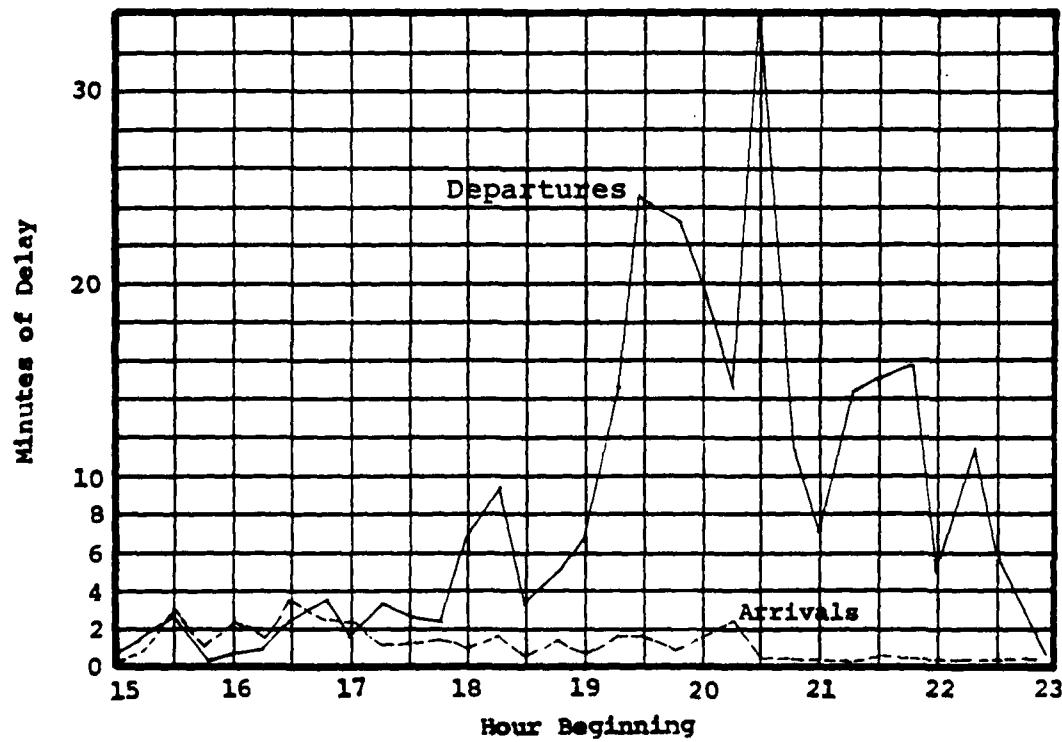


FIGURE 5C AVERAGE TAXIWAY DELAYS

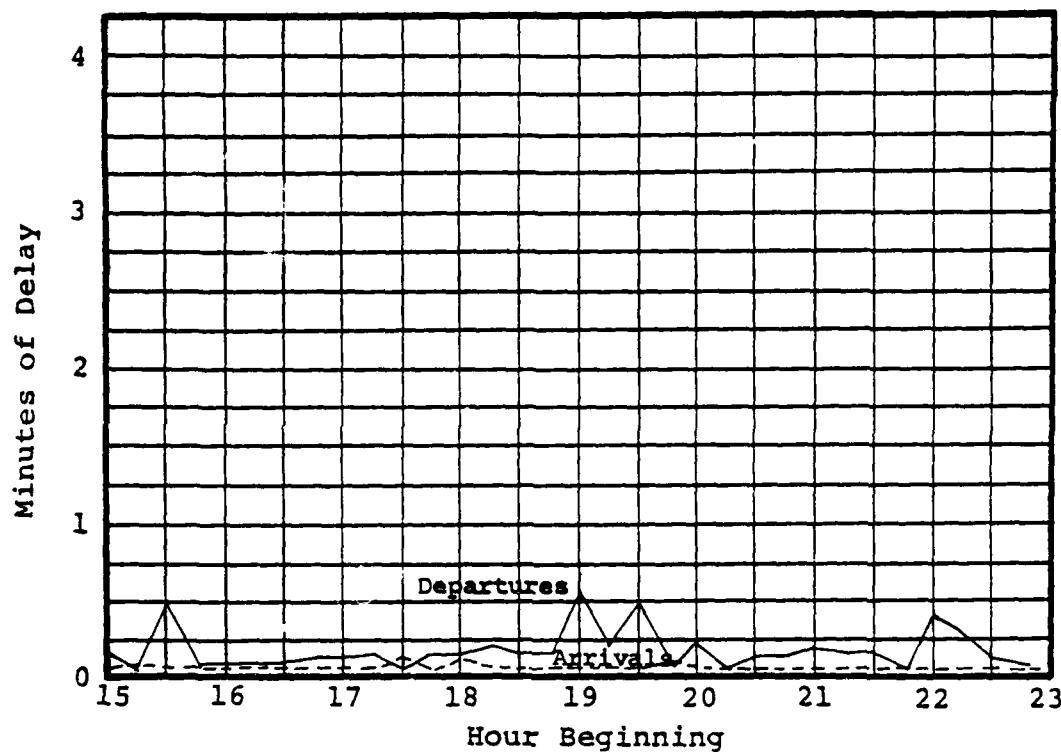


FIGURE 5D AVERAGE TAXIWAY TRAVEL TIMES

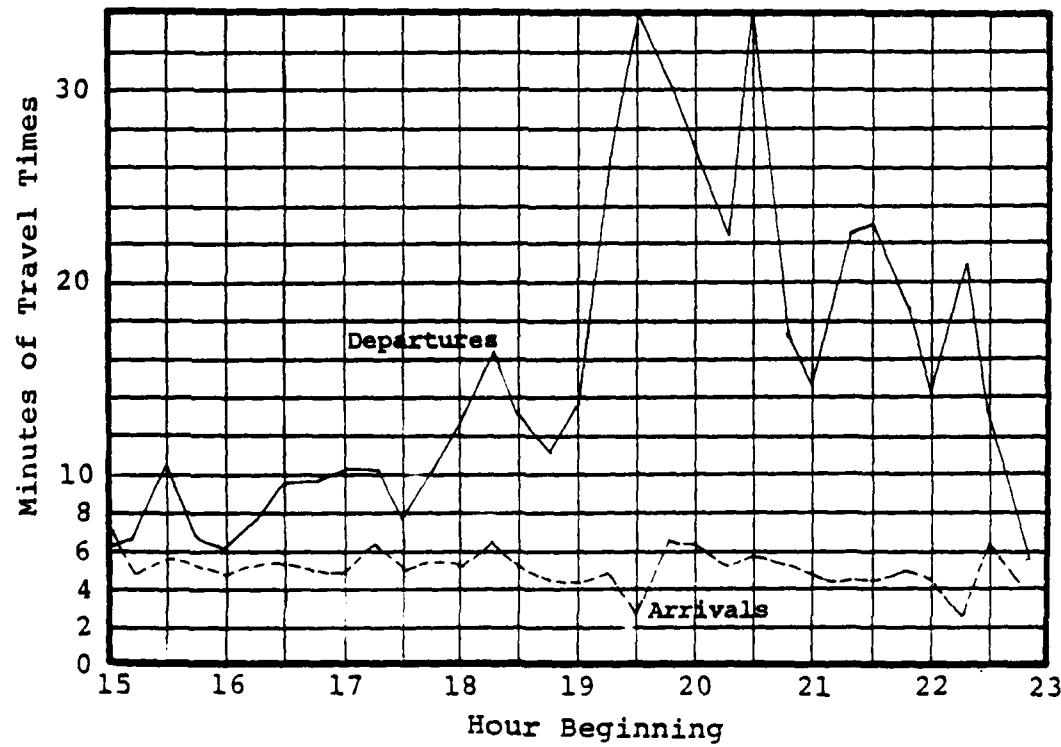


FIGURE 6A AVERAGE RUNWAY FLOW RATES

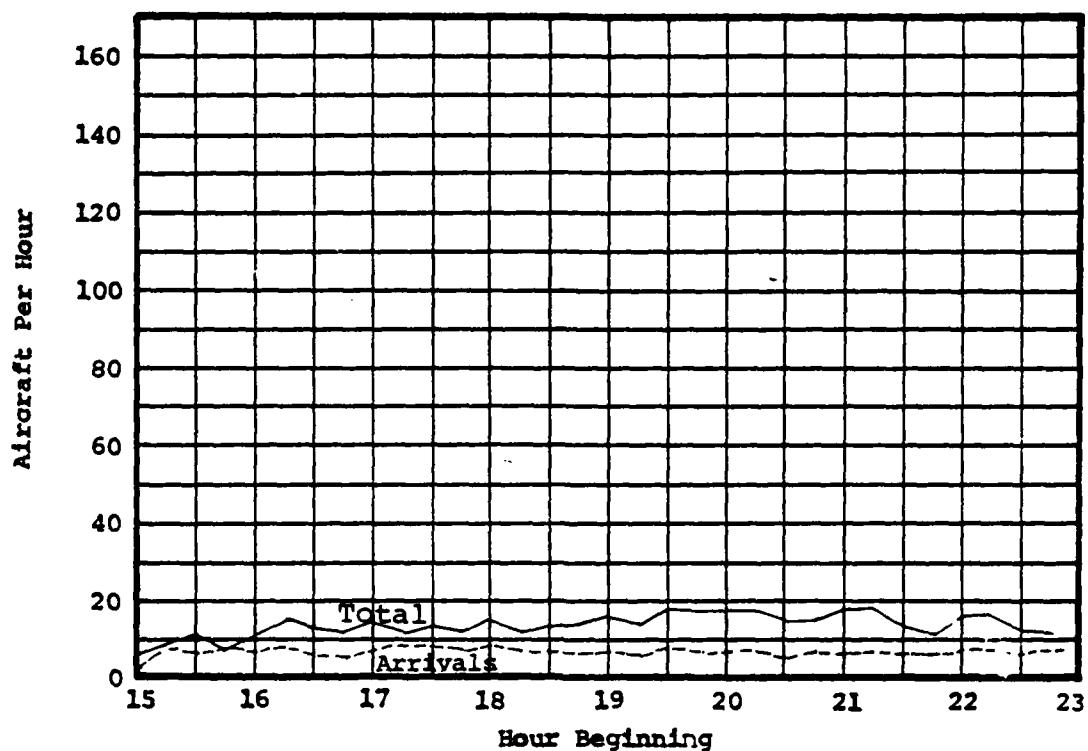


FIGURE 6B AVERAGE RUNWAY DELAYS

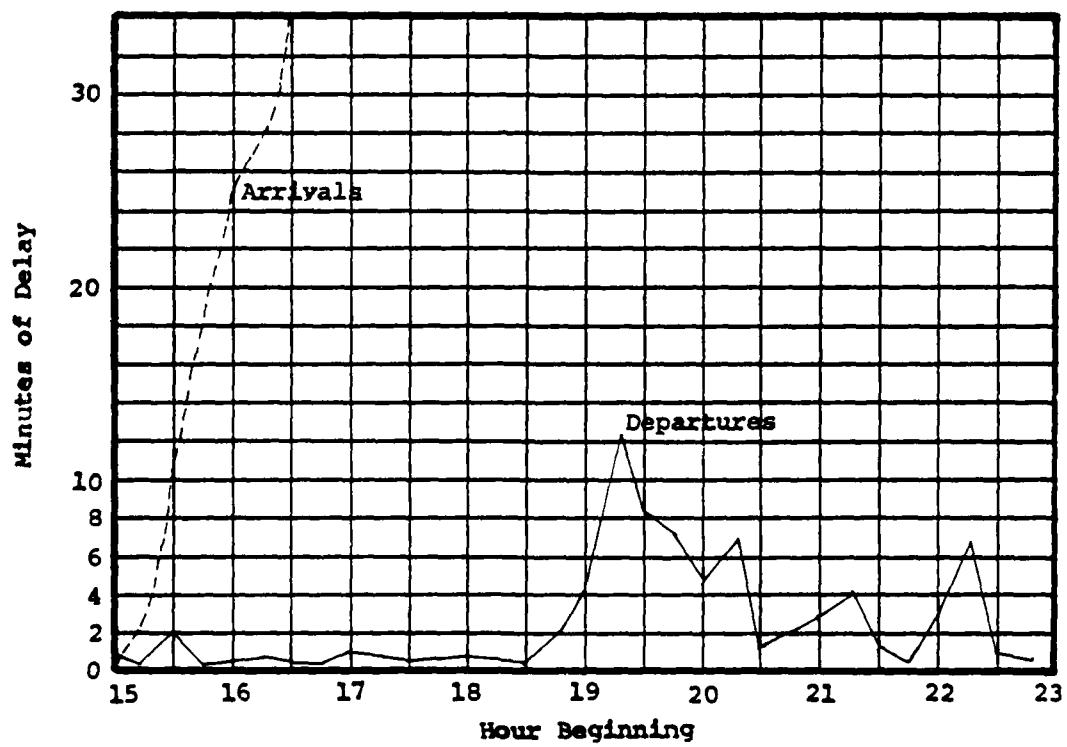


FIGURE 6C AVERAGE TAXIWAY DELAYS

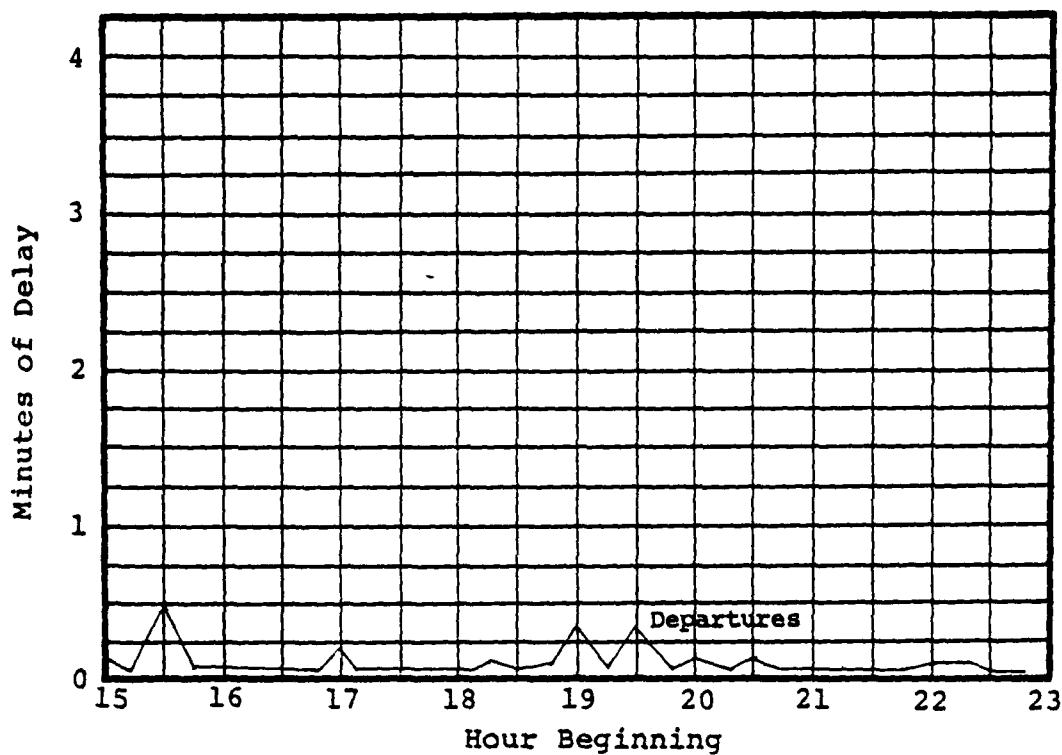


FIGURE 6D AVERAGE TAXIWAY TRAVEL TIMES

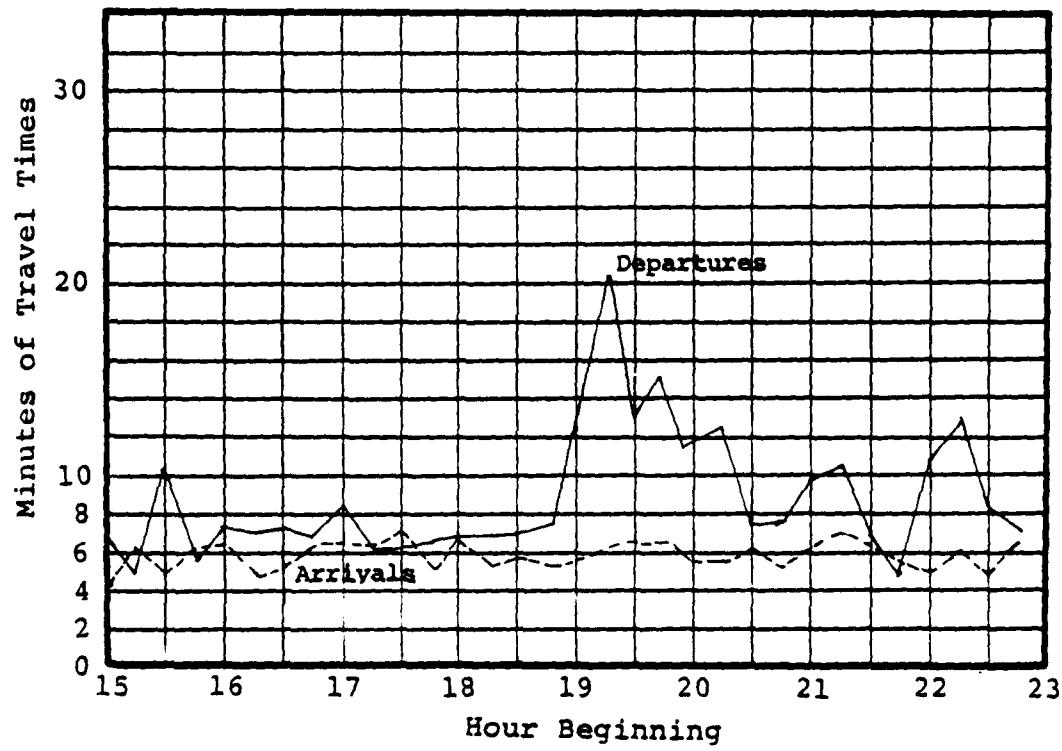


FIGURE 7A AVERAGE RUNWAY FLOW RATES

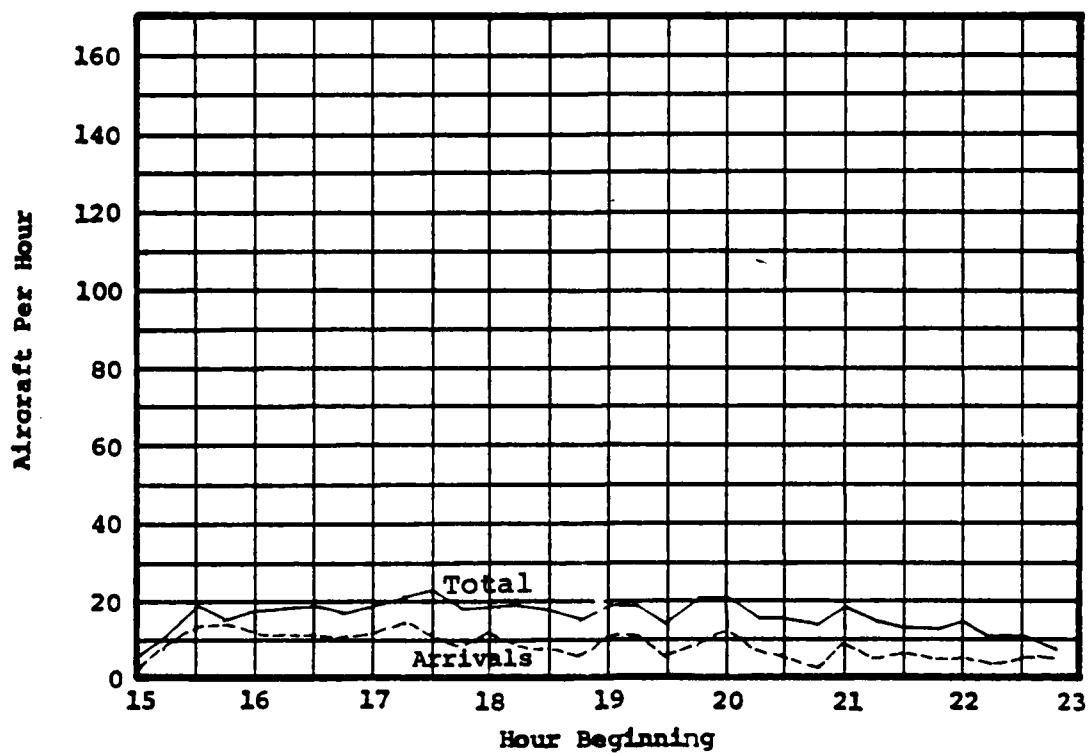


FIGURE 7B AVERAGE RUNWAY DELAYS

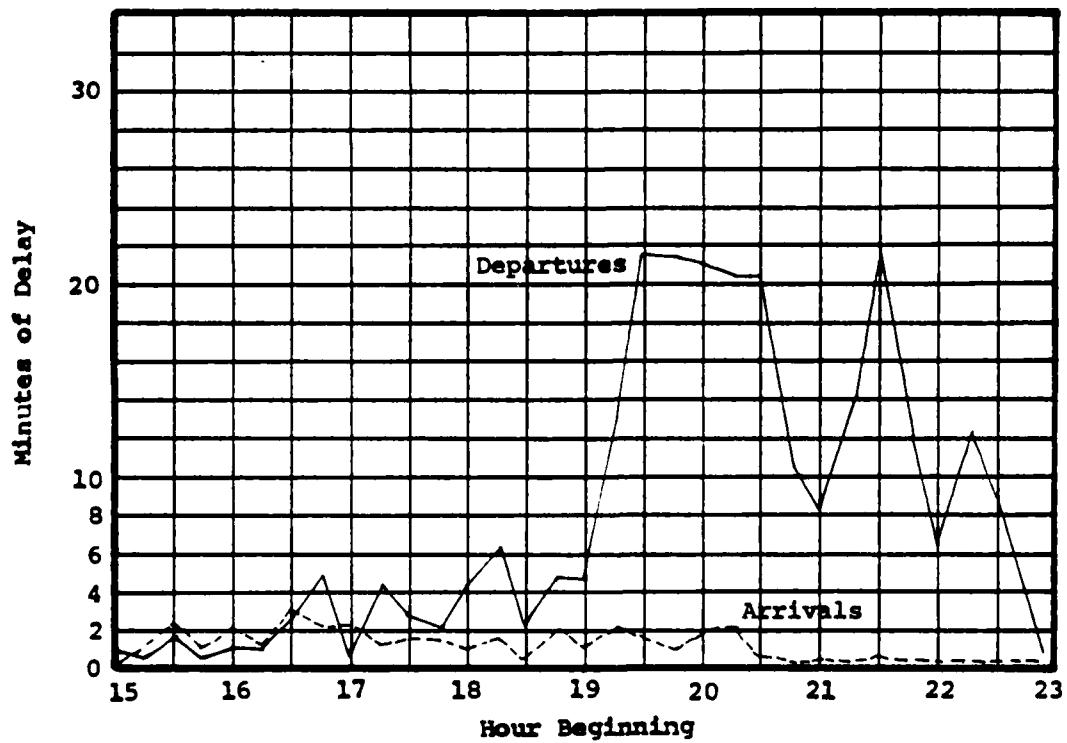


FIGURE 7C AVERAGE TAXIWAY DELAYS

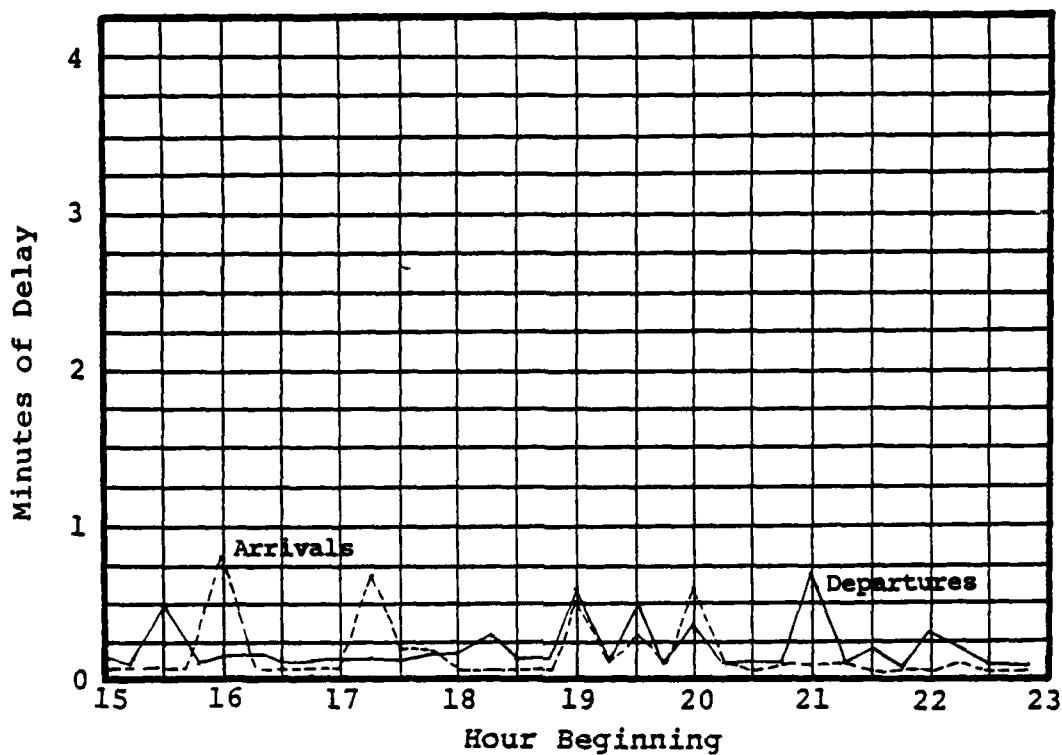


FIGURE 7D AVERAGE TAXIWAY TRAVEL TIMES

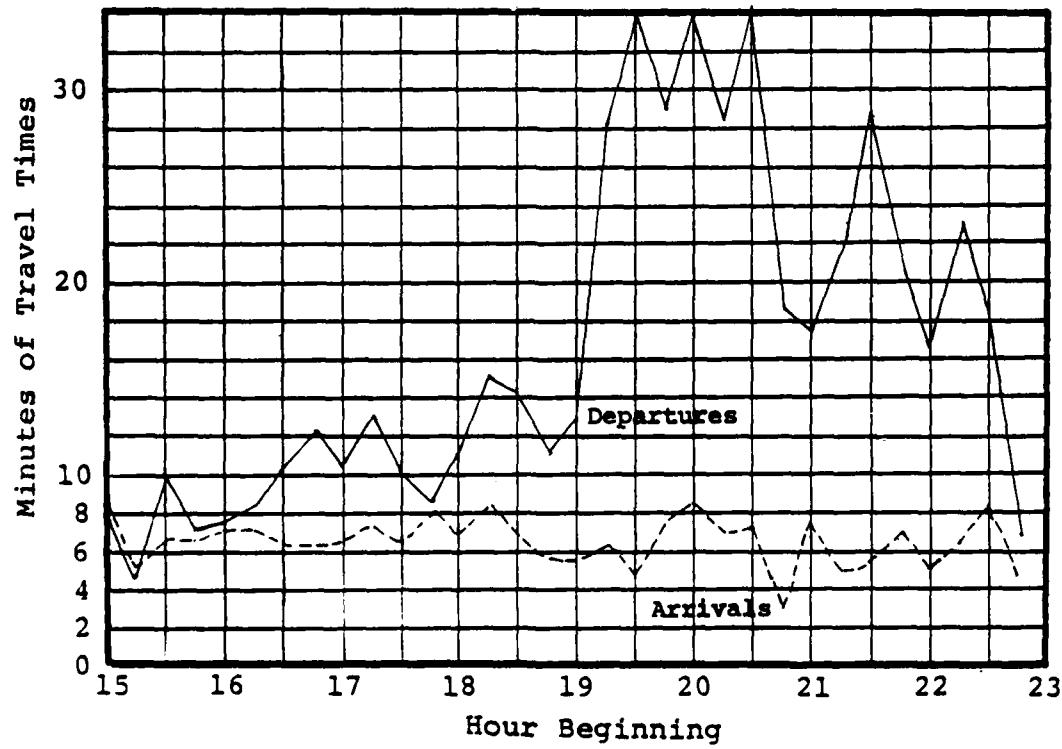


FIGURE 8A AVERAGE RUNWAY FLOW RATES

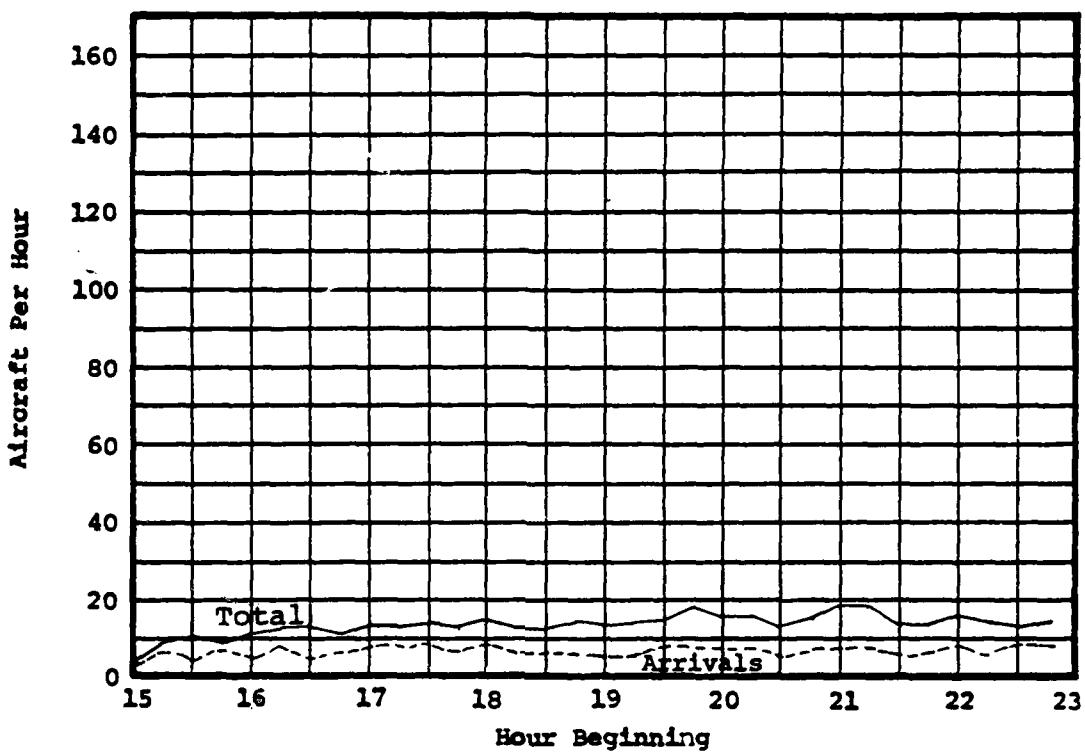


FIGURE 8B AVERAGE RUNWAY DELAYS

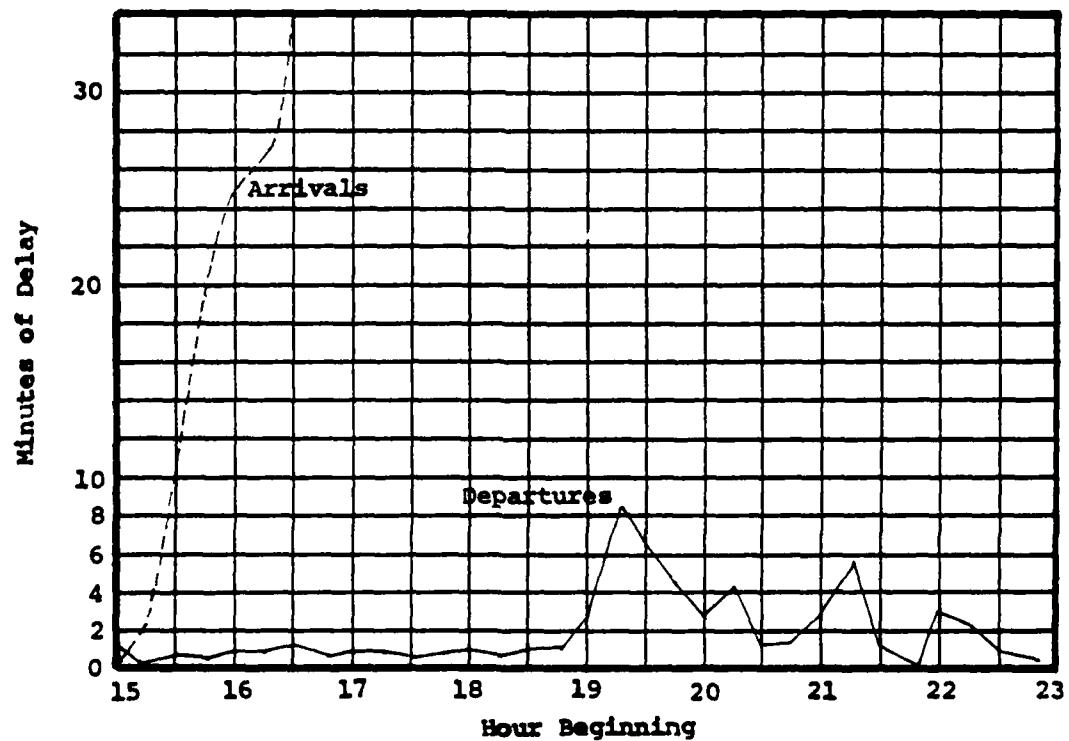


FIGURE 15A AVERAGE RUNWAY FLOW RATES

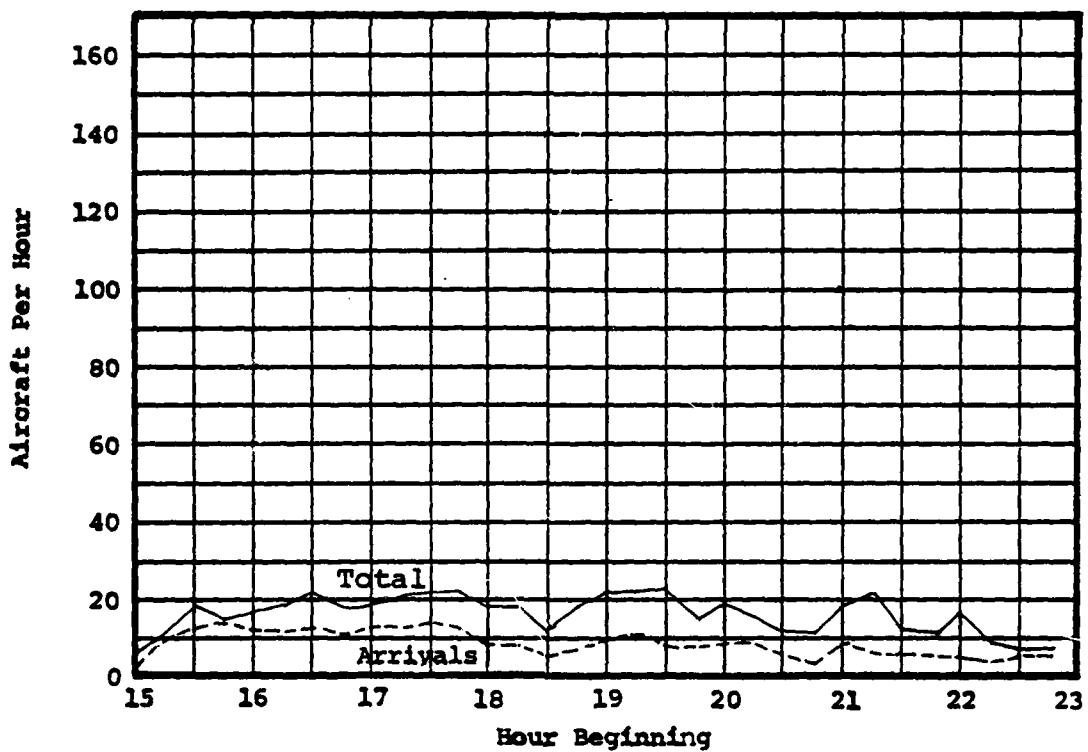


FIGURE 15B AVERAGE RUNWAY DELAYS

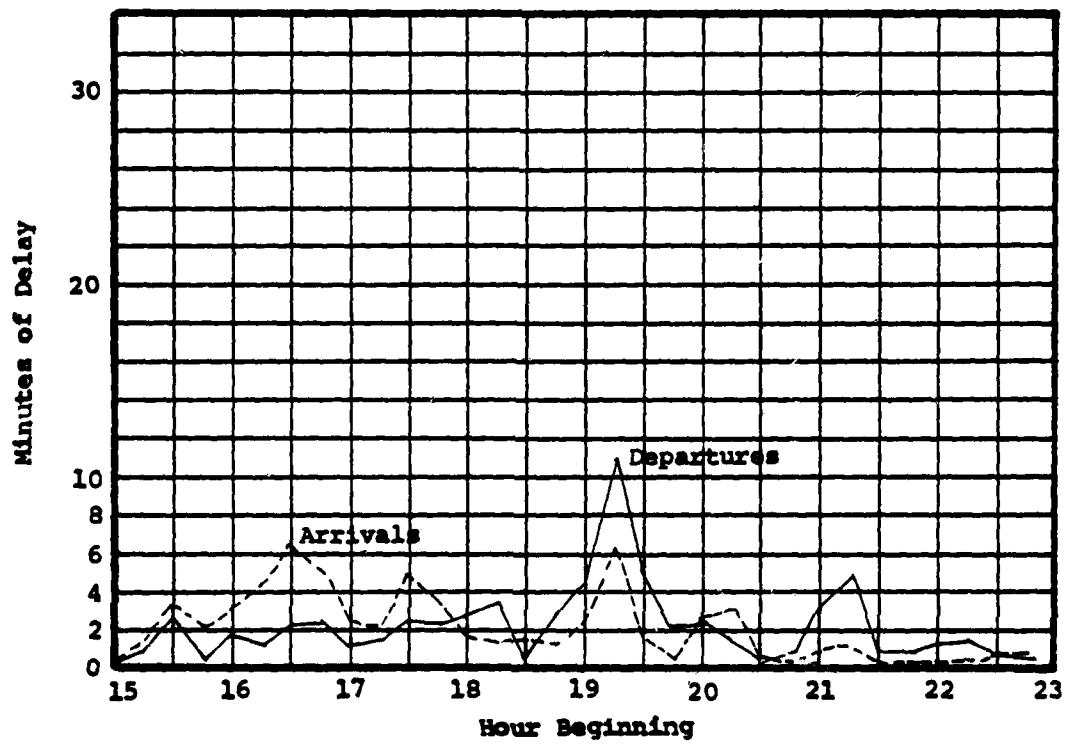


FIGURE 15C AVERAGE TAXIWAY DELAYS

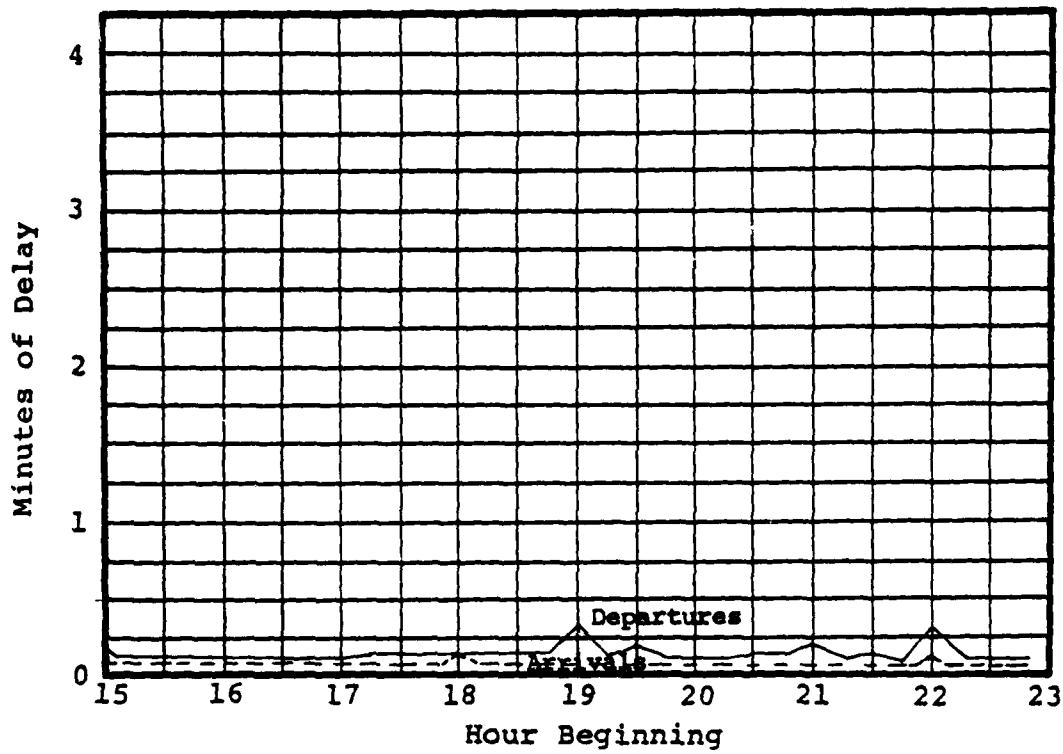


FIGURE 15D AVERAGE TAXIWAY TRAVEL TIMES

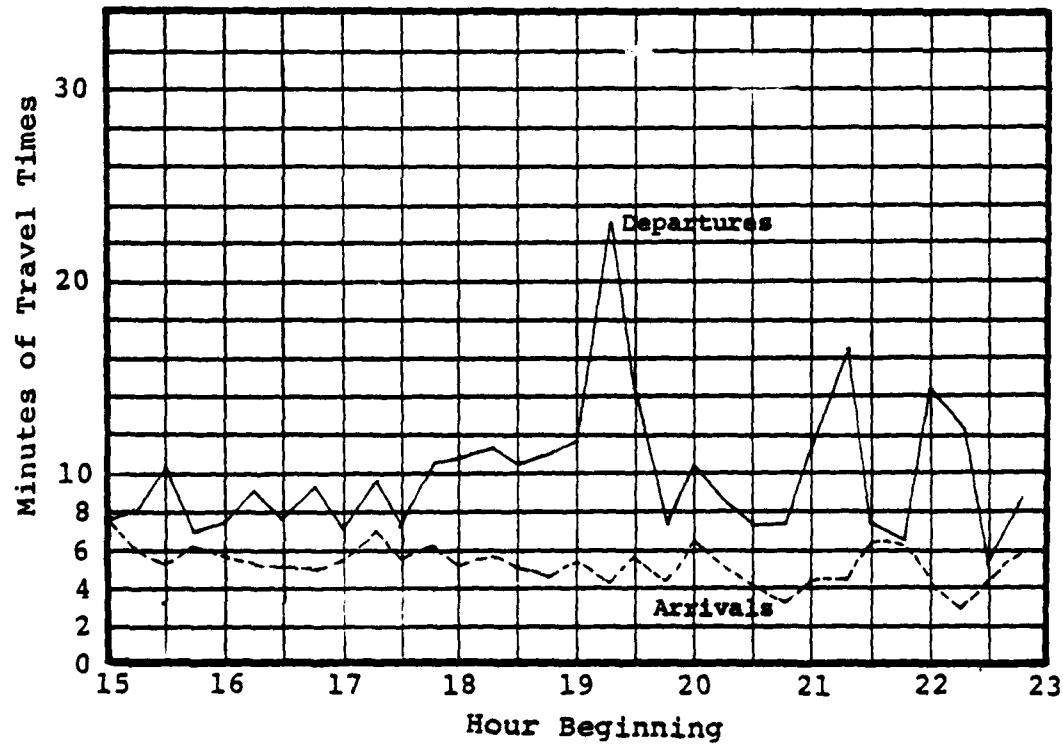


FIGURE 16A AVERAGE RUNWAY FLOW RATES

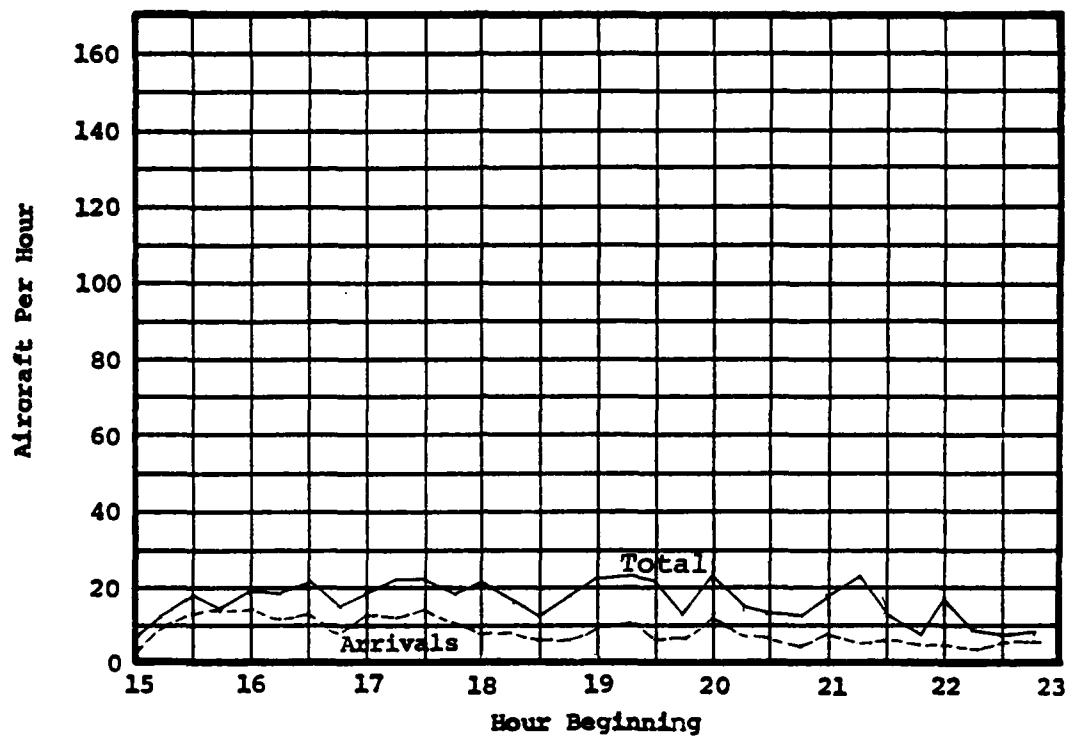


FIGURE 16B AVERAGE RUNWAY DELAYS

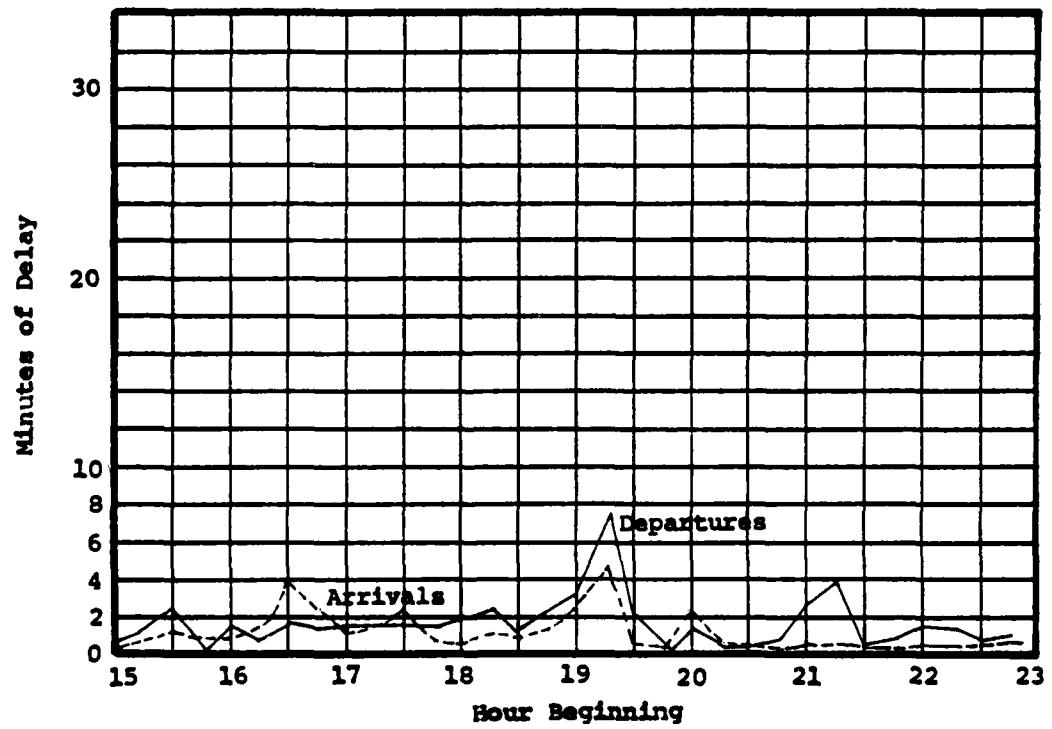


FIGURE 16C AVERAGE TAXIWAY DELAYS

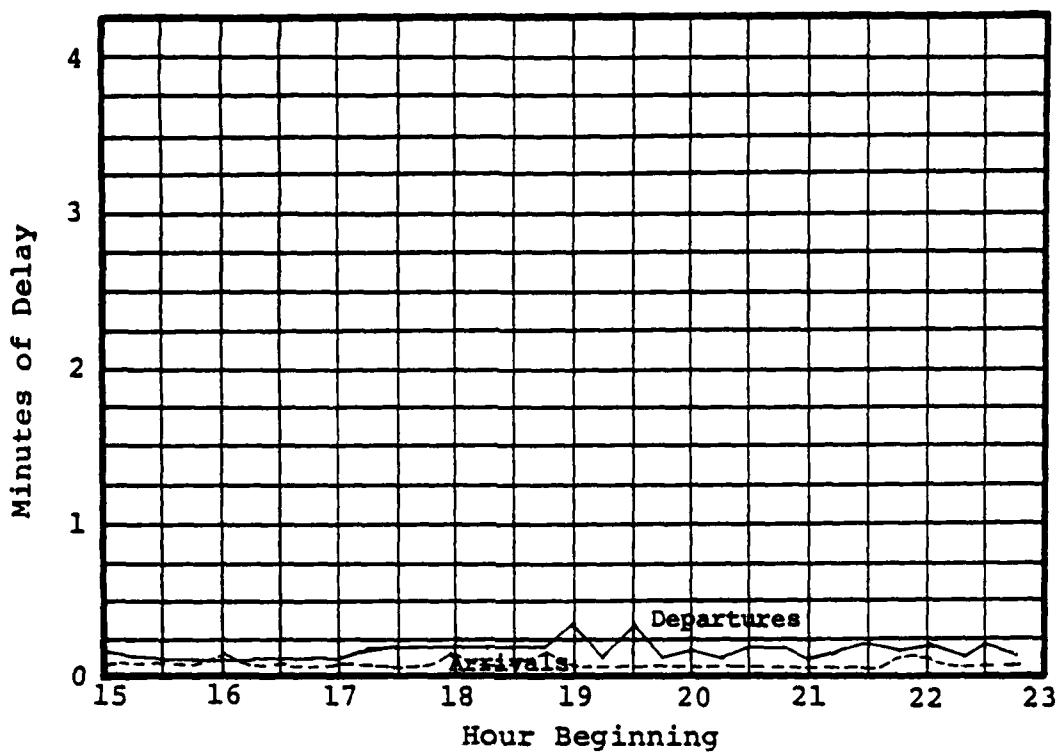


FIGURE 16D AVERAGE TAXIWAY TRAVEL TIMES

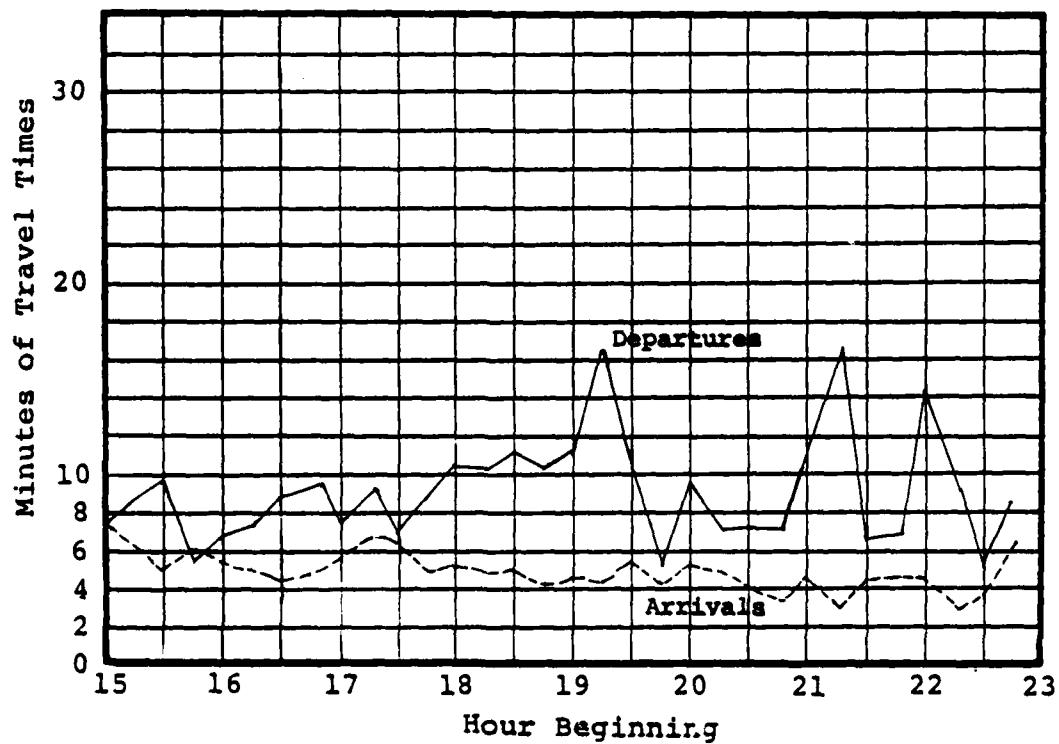


FIGURE 18A AVERAGE RUNWAY FLOW RATES

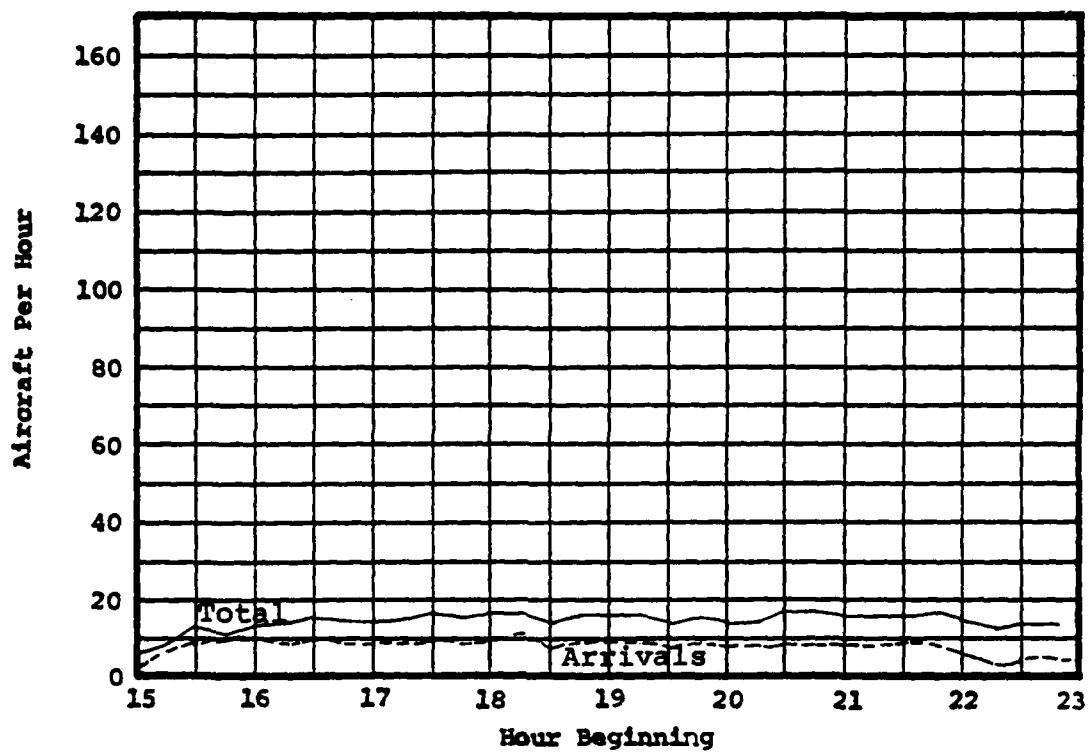


FIGURE 18B AVERAGE RUNWAY DELAYS

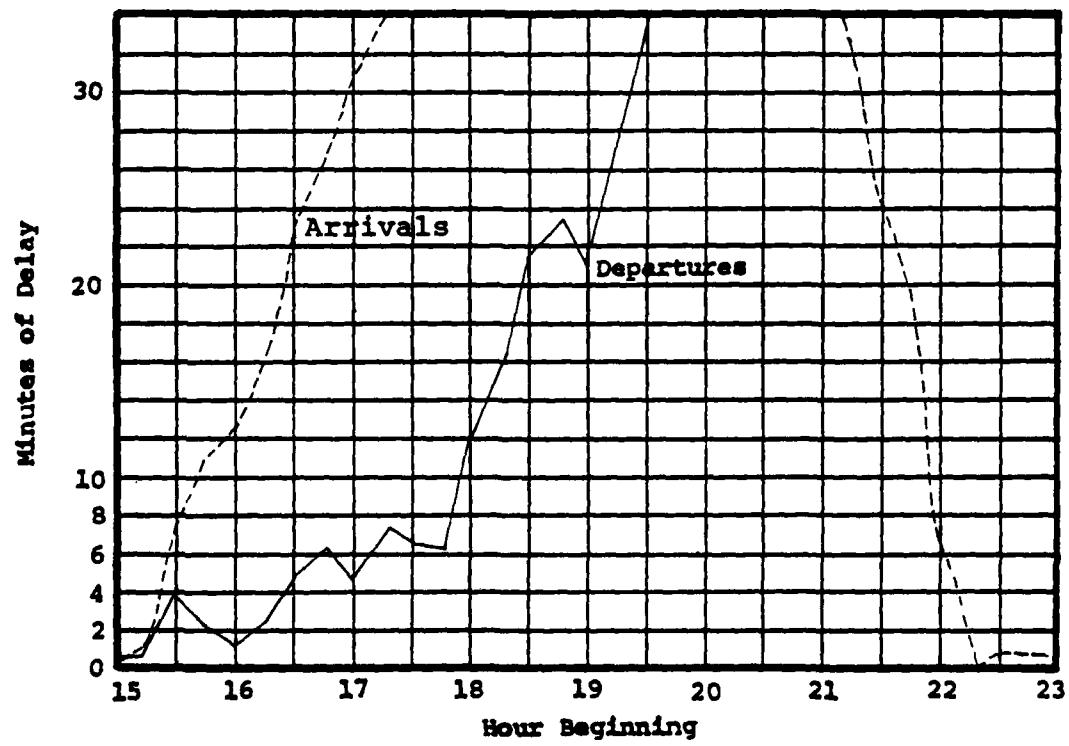


FIGURE 18C AVERAGE TAXIWAY DELAYS

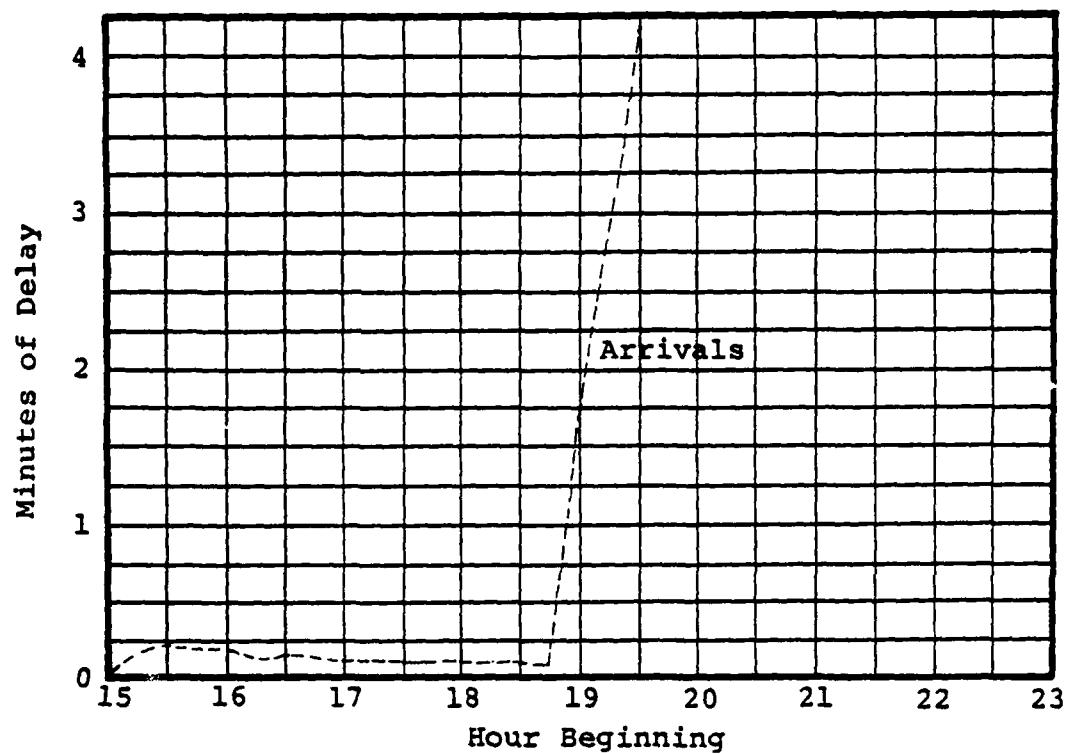


FIGURE 18D AVERAGE TAXIWAY TRAVEL TIMES

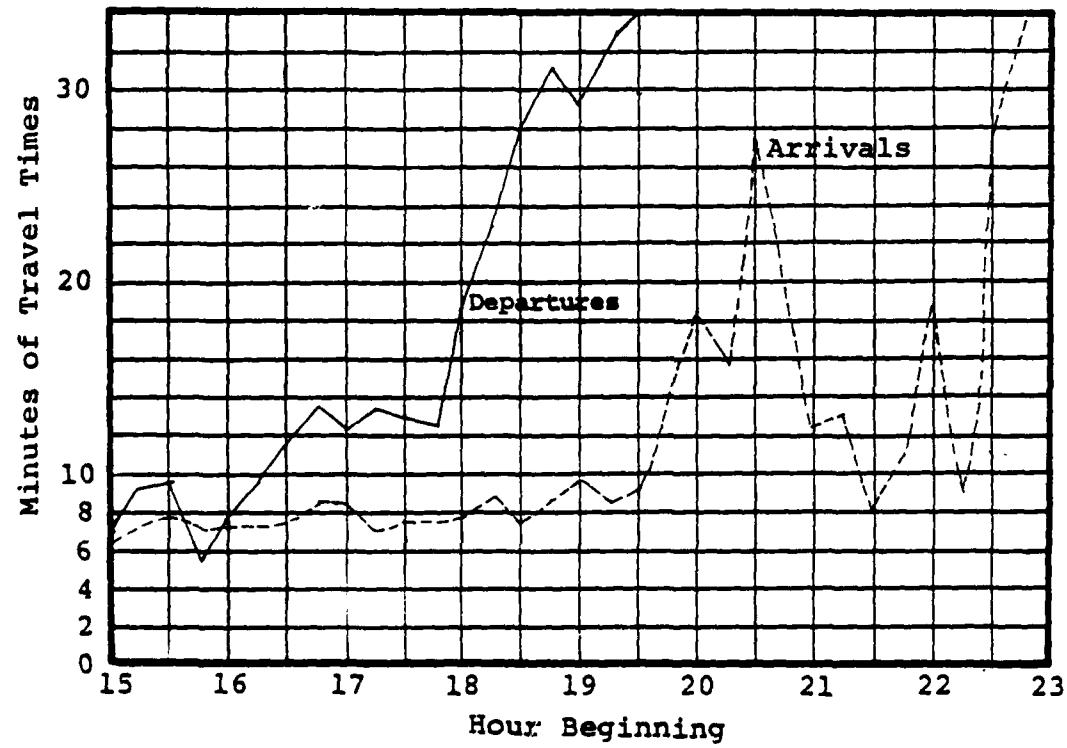


FIGURE 19A AVERAGE RUNWAY FLOW RATES

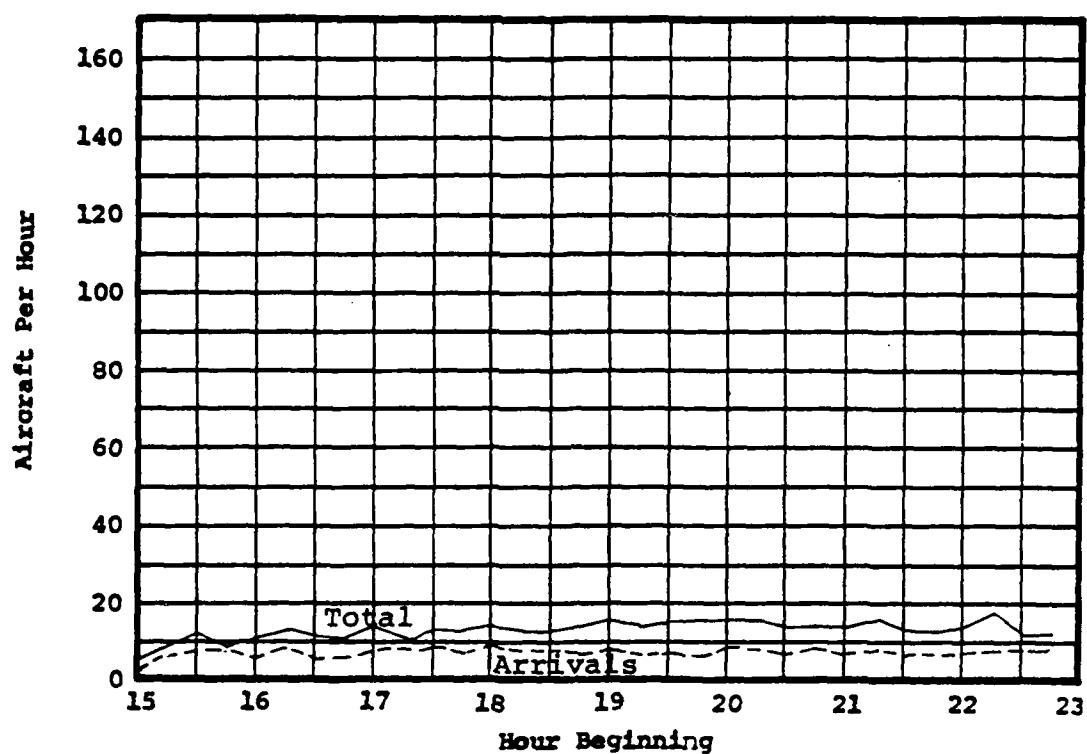


FIGURE 19B AVERAGE RUNWAY DELAYS

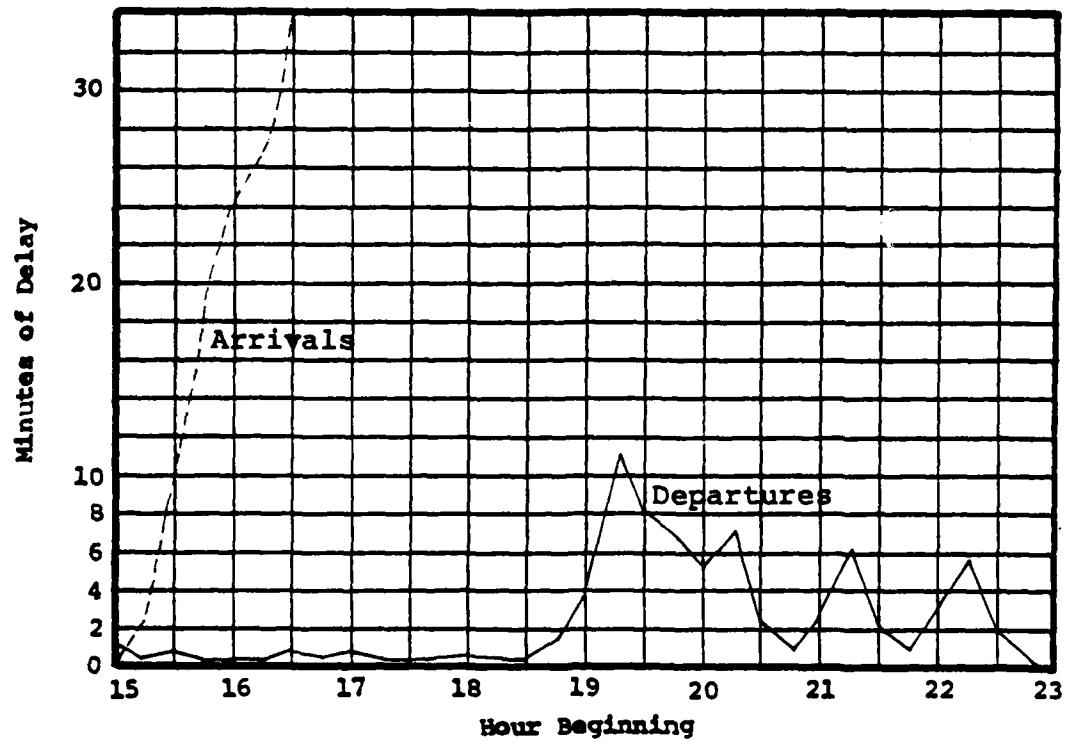


FIGURE 19C AVERAGE TAXIWAY DELAYS

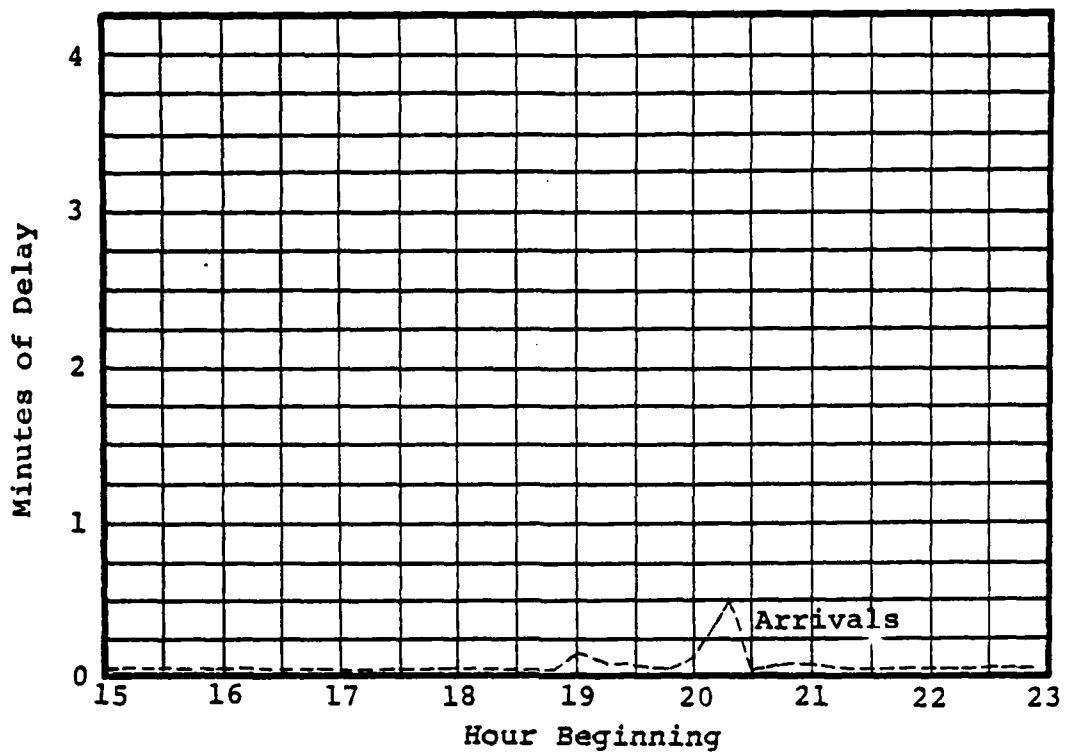


FIGURE 19D AVERAGE TAXIWAY TRAVEL TIMES

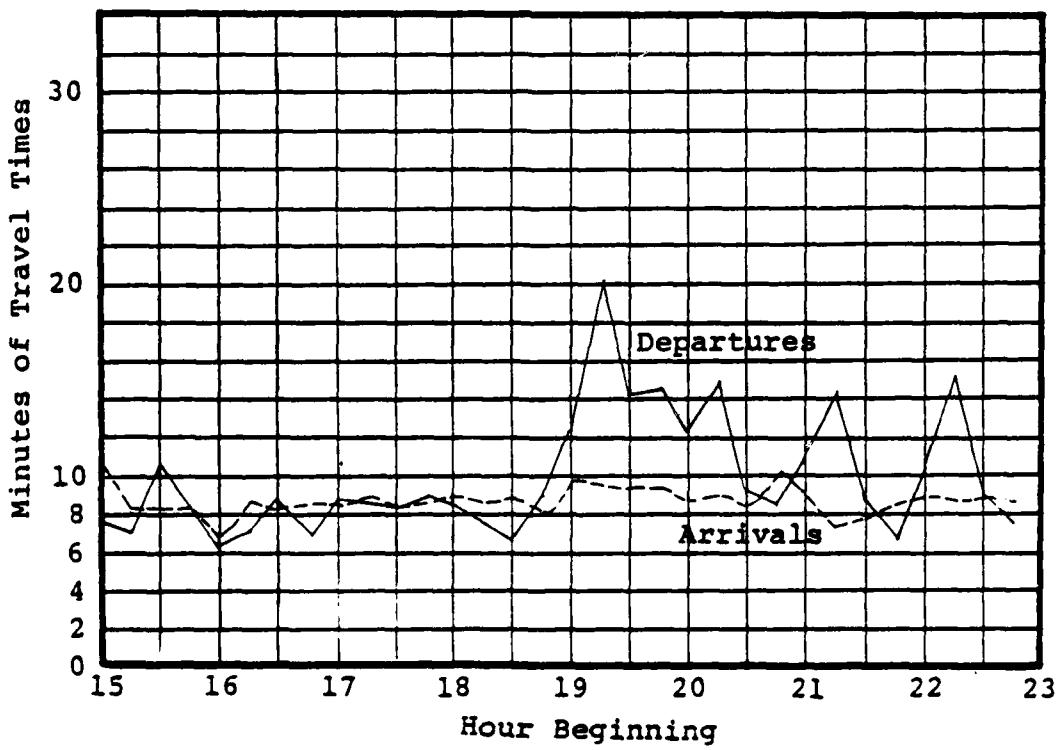


FIGURE 1A AVERAGE RUNWAY FLOW RATES

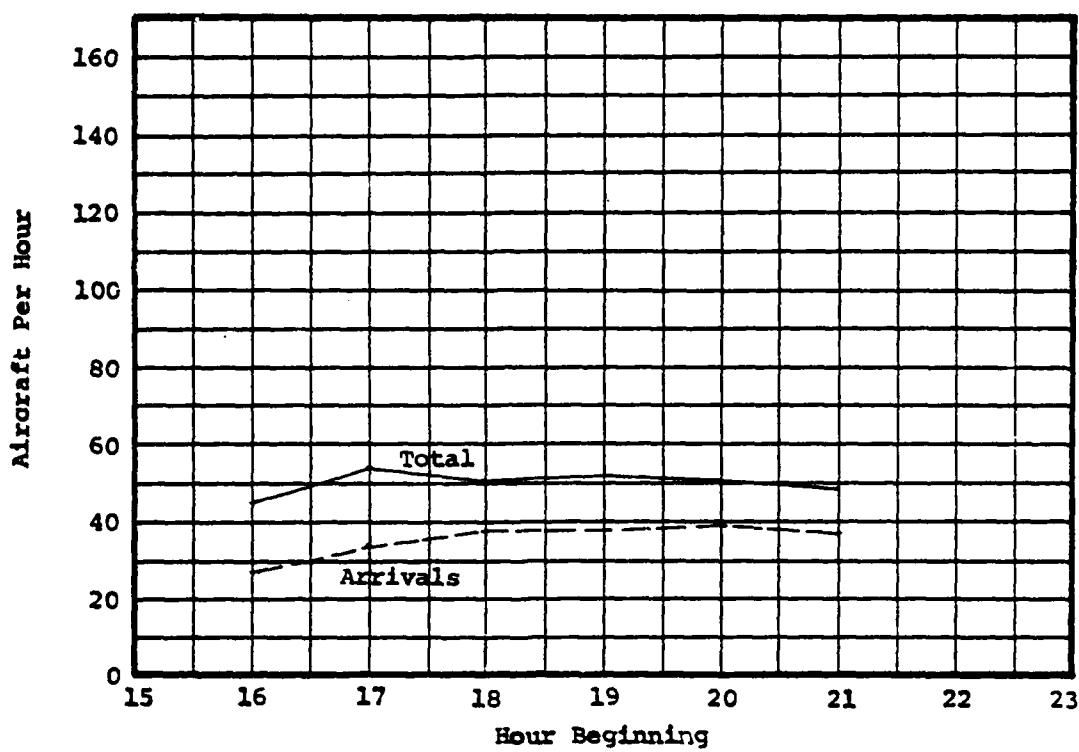


FIGURE 1B AVERAGE RUNWAY DELAYS

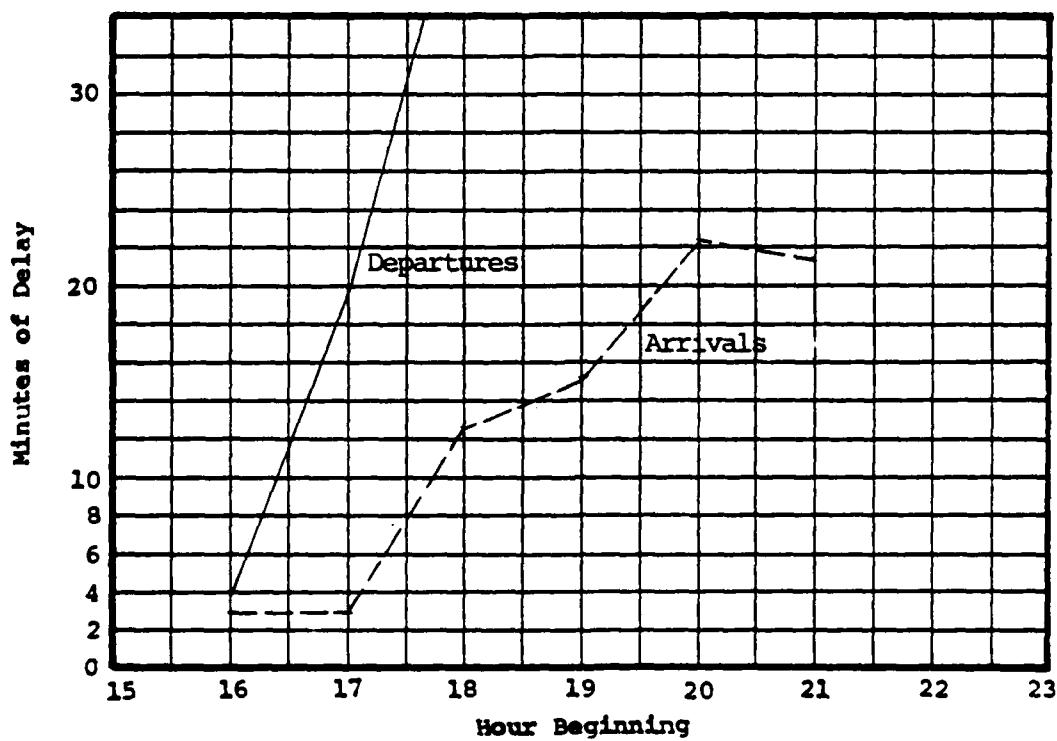


FIGURE 3A AVERAGE RUNWAY FLOW RATES

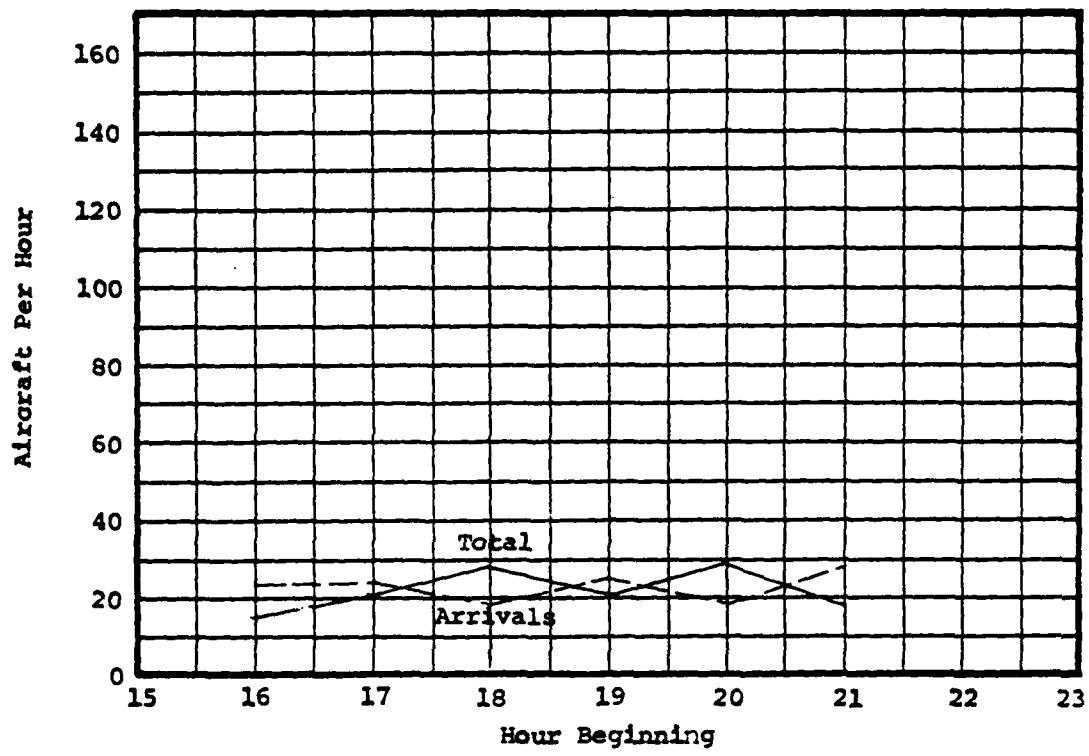


FIGURE 3B AVERAGE RUNWAY DELAYS

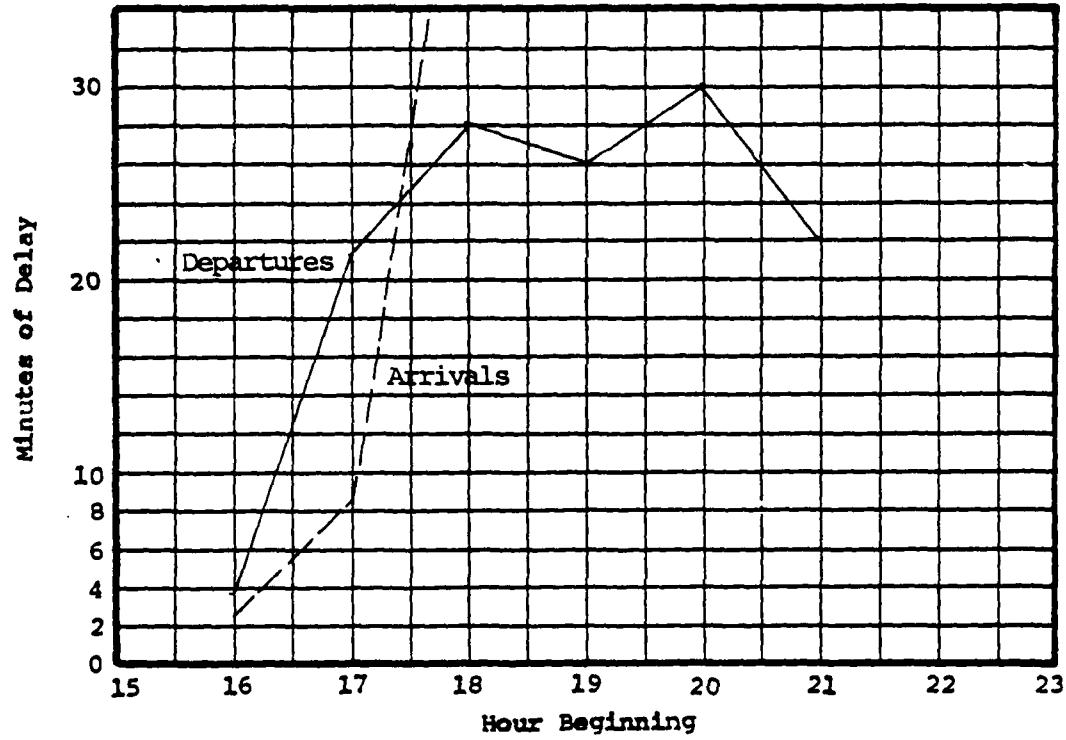


FIGURE 3C AVERAGE TAXIWAY DELAYS

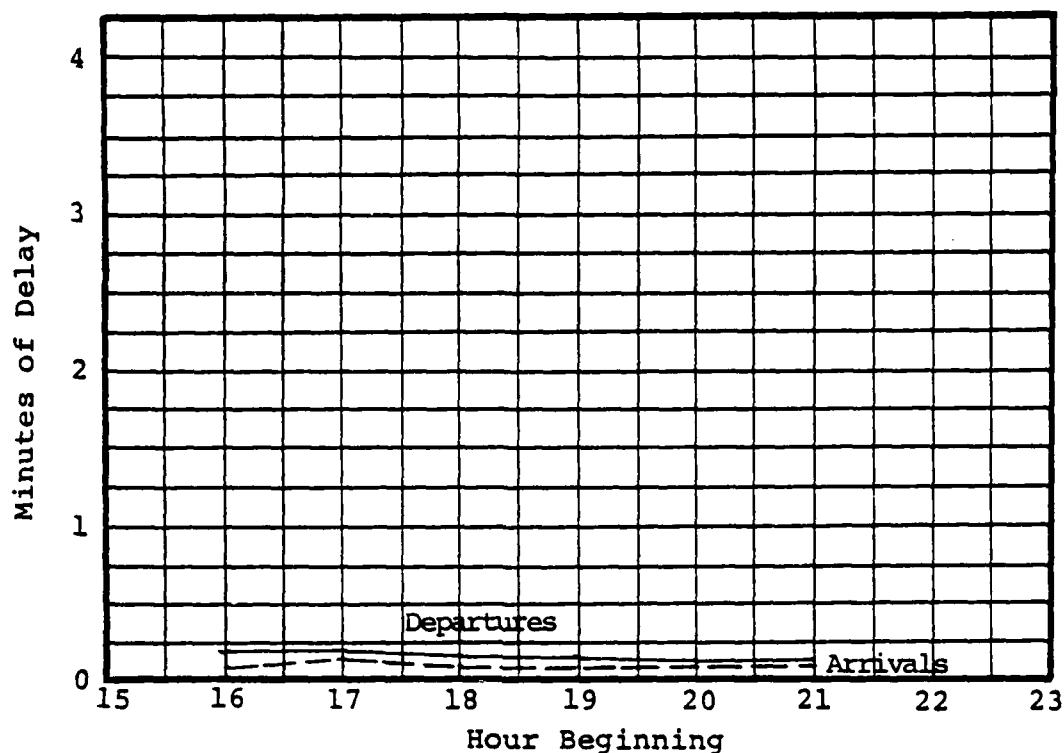


FIGURE 3D AVERAGE TAXIWAY TRAVEL TIMES

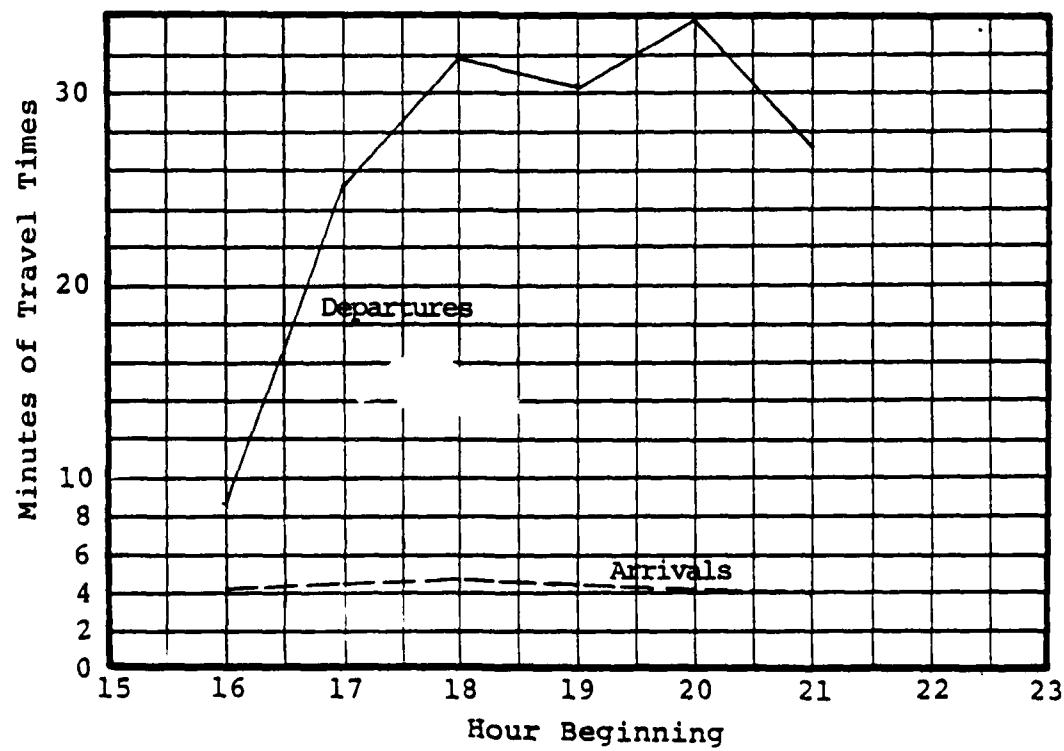


FIGURE 7A AVERAGE RUNWAY FLOW RATES

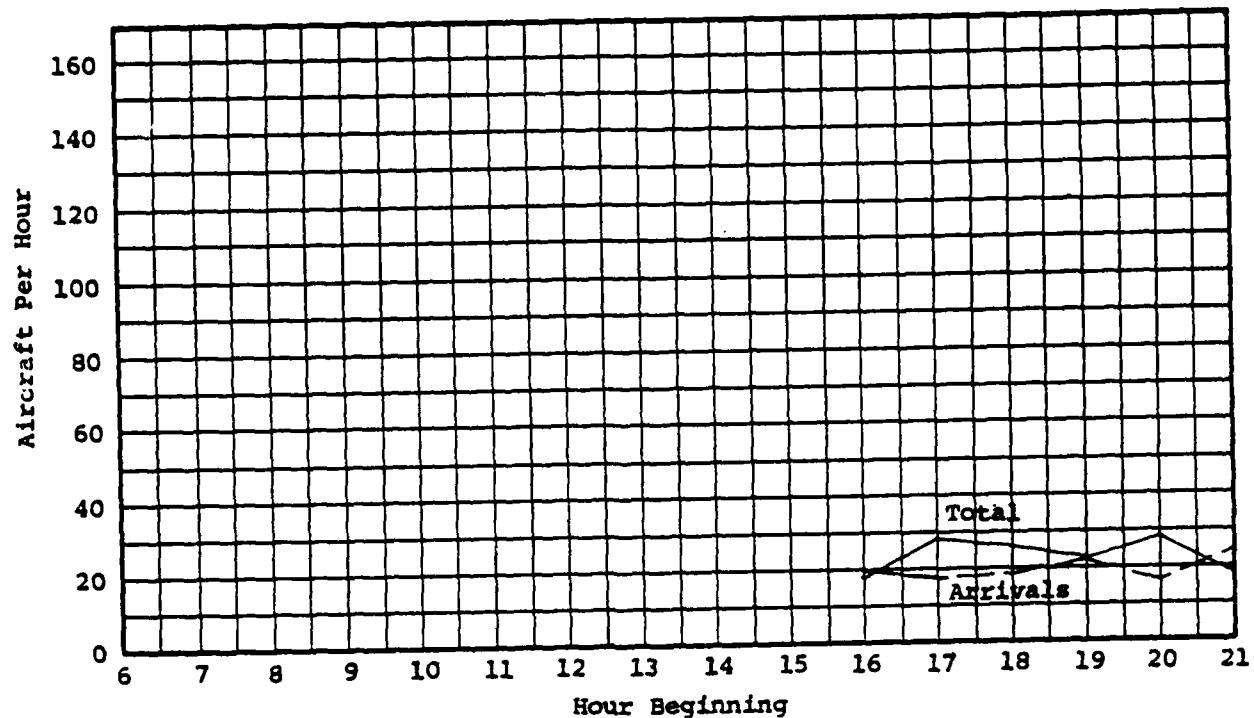


FIGURE 7B AVERAGE RUNWAY DELAYS

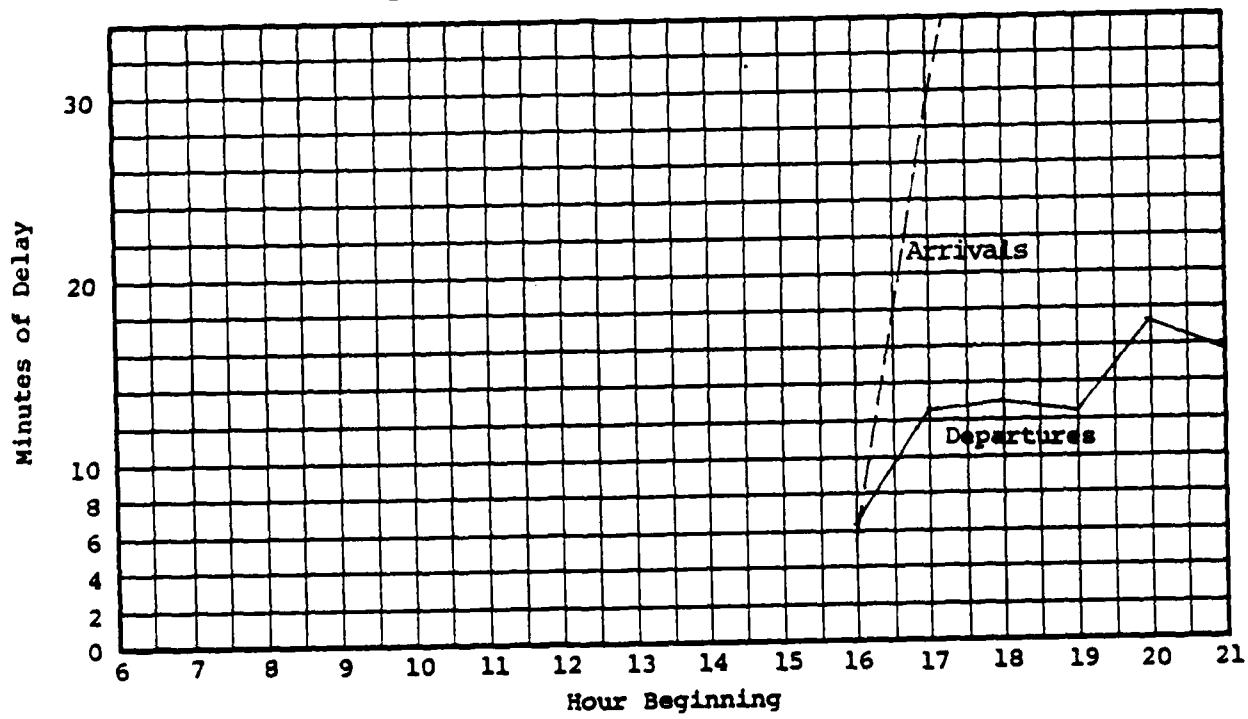


FIGURE 7C AVERAGE TAXIWAY DELAYS

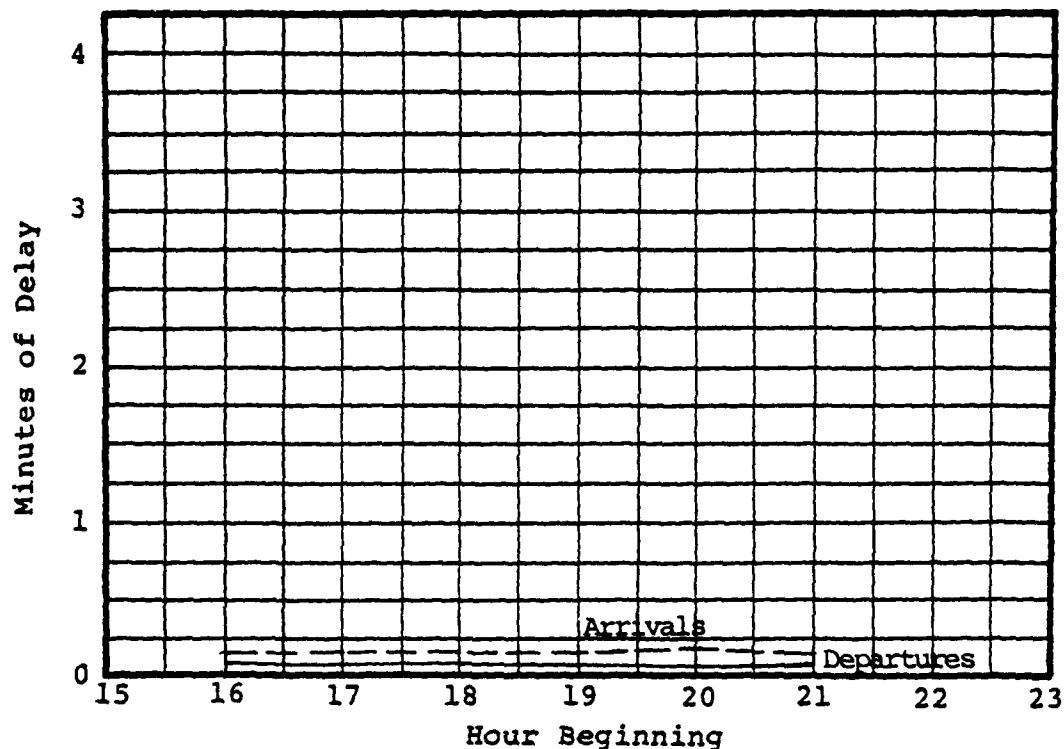


FIGURE 7D AVERAGE TAXIWAY TRAVEL TIMES

